# ELECTRICAL REVIEW

[ILLUSTRATED.]

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### Bollmann's Dynamo.

BY OTTO GRÜNINGER, C.E.

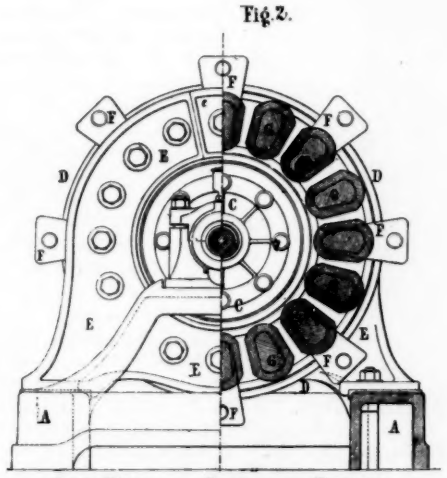
When a copper disk is made to revolve rapidly between the poles of a horseshoe electro-magnet, and no current be flowing through the coils of the magnet, then the disk will revolve freely until the originally imparted impulse has been absorbed by the frictional losses of the journals and by the resistance of the air; but the moment that a current is turned on, the disk will be stopped almost instantaneously, and any attempt to revolve it further will have to be met with an expenditure of power or mechanical work. *Foucault* was the first one to make this experiment, and it was *Faraday* who at once recognized that these results were due to the generation of induced currents within the rotating disk, and he also demonstrated the existence of such currents by actual experiment.

It was the utilization of these "currents of Foucault," as they are sometimes called, that guided Mr. Bollmann in the construction of his dynamo, of which the armature is the most important feature. His armature is essentially a copper disk. But instead of permitting the currents to flow in unconfined courses within the disk, as they do in the original experiment, he gives to them a prescribed course, such as they would naturally follow during the period of induction, and it is chiefly due to the ingenious arrangement by which the *whole* of the available volume of the armature is filled in with conductors, and by which every constituent part of any of the conductors is always simultaneously induced by currents of equal direction that he has been able to achieve the remarkable results which have been reported, and which were published in the ELECTRICAL REVIEW of April 18.

Referring to the figures, the general arrangement of the machine will need but little explanation. In Fig. 1 and Fig. 2 the engine frame is designated by *A A*, and standards *E E*. *B* is the driving shaft, with the armature *D*, the latter being held and secured to the shaft by the double flanges *C*, with some insulating substance between the flanges *C* and the disk *D*. All around the standards *E E* are placed the small stationary field magnets *G* and *F*, wound so that the poles facing one another are of opposite polarity. These magnets, however, may be arranged in two different ways. They can either be formed like *G G*, Fig. 1, in which case the poles which are situated on the same side of the armature must be alternately north and south; or each second pair of poles, facing each other, is connected by a bridge-piece, as shown at the magnets *F F*, Fig. 1. In this latter case all poles connected by a bridge-piece are neutralized, but the poles of the next following pair of magnets, with whom they are connected through the iron standards *E E*, are doubled in force. All the open or active poles on one side of the armature disk must now be north poles, and those on the opposite side must all be south poles. Either of these two constructions may be employed; they are both identical in their inducing properties on the armature. The standards *E E* are open at the top, and closed by removable segments to facilitate the removal of the shaft with armature disk without dismantling the whole machine.

The armature disk is built of radial strips of copper connected by concentric strips of the same metal, and Figs. 3, 4 and 5 illustrate the construction of what can be termed an elementary part, or simply an element of the armature. Fig. 3 is an elevation, Fig. 4 a side view, and Fig. 5 a plan of one such element. $P_1$ $P_2$ are the radial strips; the concentric strips, $R_1$ $R_2$, are bent at their ends at right angles to their planes, and soldered or riveted to the radial strips, $P_1$ $P_2$, at *a*, *b* and *c*; or the different parts, $P_1$ $P_2$ $R_1$ $R_2$, may also be made partly or wholly of one piece of metal. At *d* this *first* element is connected to the radial strip $P_1$ of a *second* element of similar form as the first one, but just sufficiently shorter in its concentric strips *R*, and also in the bent up ends of these latter, that the second element can be laid inside the first one without touching the latter anywhere, except at the point of connection *d*. In a similar manner a *third* element is connected with the point *d* of the second one, so as to find room within the second element, and proceeding in this way any desirable number of elements, generally from five to six, are placed inside one another, forming thus one consecutive spiral course. A current entering at the radial strip $P_1$, of the first element, would have to flow through all the elements of the course, one after the other, and leave again through the radial strip, $P_2$, of the last and innermost element. The different elements of such a course are separated by small and thin strips of some insulating material, sufficient to keep the elements apart, yet at the same time permitting a free circulation of air between them. Such a spiral course, consisting of a number of elements, has been called by Mr. Bollmann a *sector* of the armature disk.

Fig. 2.



SIDE VIEW AND SECTION OF DYNAMO.

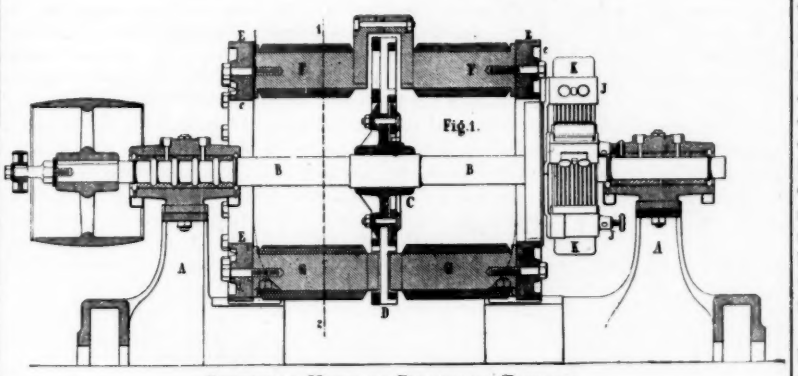


Fig. 1.

SECTIONAL VIEW OF BOLLMANN DYNAMO.

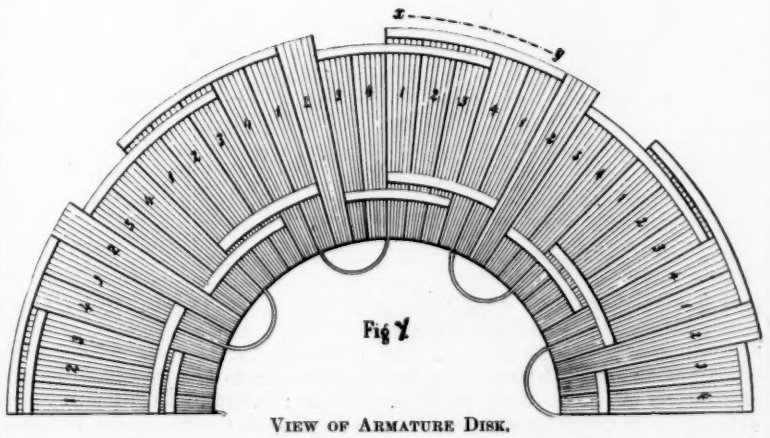


Fig 3

VIEW OF ARMATURE DISK.

The angular distance between the two radial strips, $P_1$ $P_2$, of the medium element of a sector must always be equal to the angular distance between two succeeding pairs of field magnets.

A number of such sectors having been made, they are put together, "nested" in each other, so that the radial strips, $P_1$ $P_2$, form a lattice-like disk in which the different elements are separated by the thin insulating strips above mentioned. Figs. 6, 7 and 8 show clearly how the different sectors are placed. It will be noticed that one half of the sectors is made a little shorter in the length of its radial strips than the other half of sectors, so that two distinct groups of concentric strips $R_1$, and also of $R_2$ are formed. The purpose of this arrangement is at once apparent from the drawings; it admits of "nesting" the sectors so that the concentric parts $R_1$ $R_2$ may readily pass each other on either side of the disk without ever conflicting with each other or coming into mutual contact, and thus it really renders the formation of a disk possible. Instead of having but two different lengths in the radial strips, *P*, three or more might have been employed, resulting then into three or more groups of concentric strips, *R*, instead of two.

In Figs. 6 and 8 each sector is shown as built of five elements; in Fig. 7, however, the sectors are shown as containing six elements. The numbers 1, 1; 2, 2; 3, 3; 4, 4, in Fig. 7, designate the radial strips which belong to one and the same sector; and the different lengths of these radial strips, together with the positions of the strips *R*, assist in recognizing the various sectors.

The medium angular distance of each sector being equal to the angular distance between two succeeding field magnets, each sector is always induced by two field magnets at once, and all those sectors of the disk which are equally induced at the same time (that is, all those which have the same relative position to the field magnets around the whole disk) are connected into one series, the two ends of which are branched off to the commutator. According to the disposition of Fig. 7, there are altogether four distinct series in the disk as represented there. One embraces all the sectors 1, 1, another embraces all the sectors 2, 2, and so on. Only the connecting pieces of the sectors of series 1 are shown in Fig. 7. They are all arranged and placed in recesses of the flanges *C*, and are not shown in Fig. 1.

The whole disk, then, as represented by the drawings, consists of four series; each series contains eight sectors, and as each sector is made up of five elements, the disk is composed of 160 elements, or 320 radial

strips in all. Only one of the numerous methods of packing the sectors into a disk has been shown, and there are many other ways in which this can be done.

Concerning the connections with the commutator, either the two ends of each series can be connected specially and as indicated above, or all the series are connected with one another and branches are led off from different points to the commutator in a similar manner as this is done with a Gramme ring. The construction of the commutator itself is immaterial, and therefore of no special interest.

The poles of the field magnets approach closely the radial strips *P*, within the annular space formed by the concentric strips $R_1$, $R_2$, and as shown in Fig. 1. It is also of great importance that these latter be as close as possible to the poles of the field magnets, because, when the disk is rotated, useful currents are generated both in the parts *P* and *R* of the armature. It may be truly said that there is not a single part of the whole disk (except that portion by which the disk is held to the shaft) which is not utilized in the generation of currents. The radial strips being narrow (in the experimental machine, the performance of which was described in the ELECTRICAL REVIEW of April 18, they were but one-half inch thick) the opposite poles of the field magnets are only a short distance from each other, and a most intense magnetic field is produced with very small field magnets.

In all machines which use iron in the armature, the useful currents are mainly produced by the alternately growing and vanishing magnetism of the iron in the armature, and one of the governing considerations in the construction of such machines is based upon the very considerable resistance which the molecules of iron oppose to any change in their magnetic condition. The induction being secondary, and the resistance of the iron considerable, the number of alternations in polarity is limited if an undue heating of the armature is not to take place. In the copper armature of Bollmann the induction is direct, the current is started at once, and with high electromotive force in a most intense magnetic field, and with the general disposition of the machine, the number of revolutions of the shaft is considerably smaller than with any of the present systems.

In regard to efficiency, when considering the size of this new dynamo, no other machine can be compared with it; and it really is difficult to conceive how so small and light a disk could produce such a large and powerful electric current.

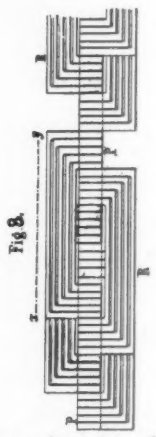
Efficiency, weight, size, and the low number of revolutions, together with simplicity and security of construction, will give this dynamo the preference above all others, and for these very reasons it will also prove to be of extreme value in all cases of electric transmission and reconversion of motive power.

The United States patent has just been granted and will be published shortly.

## Electricity in Medicine.

BY HARRISON ALLEN, M. D.

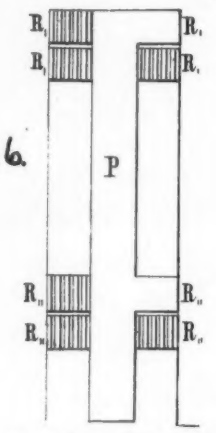
In 1873 I began a series of observations on the use of the galvano-cautery in the treatment of nasal disease. At that time the only battery available for the purpose was that of Burn's, an instrument which, notwithstanding the fact that its activity is dependent upon the immersion of the plates in a stationary bath, and the additional defect that currents of air are to be constantly transmitted through the fluid to secure efficacy, combines many advantages, among which may be mentioned its portability, the ease with which it can be cleansed, and, I may add, its durability, for the instrument at that time purchased has been in almost daily use for ten years. The greater number of these observations now recorded, therefore, were made with the Burn battery, although I have supplemented it in my practice with a larger, more efficient, yet bulkier instrument. At the beginning of my studies I was much discouraged to find that the conductors, the electrode, and the circuit maker were all large, heavy, and imperfectly adapted for use upon chambers, so small and imperfectly illuminated, as are those of the nose. The cords were heavy and cable-like, and the electrodes adapted for the coarser purposes of surgery. In these respects they were admirably adapted (let it be understood) to all operations in general surgery, and especially to those involving vascular structures, such as the tongue. I desire to return my acknowledgments to Mr. Otto Flemming, of Philadelphia, to whom the problem was presented in 1874, to furnish for the purpose I designed a more delicate electrode and a lighter and more available form of conducting cords. Without detaining you with the details of Mr. Flemming's efforts, aided by my own suggestions, I succeeded about the time abovementioned in having prepared for my use a form of electrode which has remained to this day the basis upon which all similar instruments have been made which have been used by me (Fig. 1). The electrode is simply a pair of delicate copper wires, measuring a




PLAN OF ARMATURE DISK.

little over one millimeter in diameter, separated throughout their entire lengths by asbestos, except at those portions which are continuous with a terminal platinum loop. The copper wires and asbestos are firmly wrapped with insulating silk, and the entire instrument when completed will present an average length of fifteen centimeters, a width of from two to three millimeters, and the platinum loop varying in length from three to fifteen millimeters. The weight of each one of these electrodes never exceeds 148 grains. Such an electrode is flexible, is readily cleansed, is light in weight, and is durable. The platinum loop at the end of the instrument can be modified in shape in ways already understood by electricians, and nothing novel is presented under that head. The extent, however, to which the platinum loop may be made to extend beyond the copper wires is a matter of much importance, if it is desired to make a linear eschar. It follows that the length of the platinum loop will determine the length of the eschar itself. When, however, a mere point of contact with the living membrane is desired, there is no objection to wrapping the electrode almost its entire length, thus leaving a mere tip of the platinum exposed. When it is desired to apply the cautery to the naso-pharynx, it is prudent to wrap every part of the instrument except its free end, in order that the posterior edge of the soft palate be not involved in the burn.

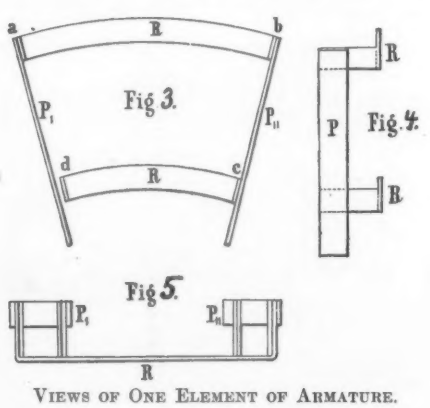
The width of the cable with which I began my observations equaled about ten milli-




SECTION OF ARMATURE DISK.

meters; but for the last year I have succeeded in having very satisfactory results from a cord exactly one-half this width, and of corresponding light weight. I desire next to call your attention to the battery which I have now in use, a battery designed by Dr. Carl Seiler and Mr. Otto Flemming, and known under their names. The novelty of the battery consists in the fact that the plates themselves are stationary, and the fluid is brought in contact with them by an upward motion, which is determined by the pressure of the operator upon a treadle. The advantage of this method of bringing the plates in contact with the fluid is a decided one. The moment the foot of the operator is removed from the treadle, the current ceases, and there is no danger, as is so often acknowledged to exist in the use of the Burn battery, of neglecting the plates and allowing them to remain in immersion a longer time than is needed.

We have in this apparatus an exceedingly powerful agent, especially when the battery is made of double strength, as I have of late been using it (Fig. 2); that is to say, when two batteries (each one representing the chemical strength of that instrument known as the "Seiler-Flemming battery," worked by a single treadle) are united. A current from this powerful instrument is passed into a single short loop of platinum wire, and develops a heating effect of the highest destructive power. Yet the degree of heat is so rapidly evolved as to produce the desired effect upon the membrane with




VIEWS OF ONE ELEMENT OF ARMATURE.

the least amount of pain. It may be held as an axiom, in the application of the galvano-cautery, that the pain of an application is in direct ratio to a low degree of incandescence; or, expressed differently, the ease with which the applications can be borne is in direct ratio to the scintillating appearance of the loop and of the white color which attends incandescence. The single disadvantage associated with the employment of the white scintillating incandescence is the danger, or rather the liability, of fusing the platinum wire; but this can be readily averted by bringing the wire in contact with the tissues which it is destined to destroy, immersing the plates in the fluid, and then making a current. The contact should be of momentary duration, and be limited simply by the time which the will power can press upon the button at the side of the current-maker. The moment the finger presses the button inward there is a quick flash of light from the electrode; the instant it is removed, the wire again becomes of the ordinary appearance of platinum, so that while the process of destruction is going on the finger of the operator is opening and closing the circuit very much after the manner in which a telegraph operator works the Morse indicator. With one exception, which followed upon the incautious pressure of the button, thus making a circuit before the battery fluid was raised up against the plates, I have never fused a platinum loop. In the instance named, the short interval of time which intervened between the appreciation of intense heat, which I had thus inadvertently maintained in the loop, and the time required for me to break the circuit, was sufficient to fuse the wire.

It goes without saying that with a battery so powerful, great prudence is required in manipulating the electrode; but when properly used, and with the precautions which naturally belong to the use of all surgical agencies whatsoever upon the living economy, I can say that the galvano-cautery in the treatment of nasal disease is absolutely safe. The single point which may be urged —that is to say, one which at least came to me with a sense of surprise—was the effect upon the tissues at the side of the platinum wire not in contact with it, but simply in its neighborhood. The tissues were thrown into a state of high vascular excitement by the presence of the heated loop near them; and one can very readily understand that the amount of radiant heat thrown off to the membranes in their immediate proximity from the heated wires would produce a roasting effect if long maintained in one position; but, fortunately, almost all effects desired by the use of the cautery are obtained quickly, and two or three flashes of heat from the electrode, while it destroys the tissues which are in contact with the loop, do not have, in a chamber so moist as is that of the nose, any deleterious effect upon the adjacent surfaces. One of the most annoying effects in the use of the heated wire is noticed in the removal of tumors from the roof of the naso-pharynx, for in this region the contact of the heated wire at the base of the growth is at the same time in close proximity to the structures at the orifice of the Eustachian tube, and the destruction of the tumor may go on coincidently with the roasting of the membranes at this orifice; but even in this instance the heated wire need be maintained for a short time only; as the loop is narrowed, it passes more and more toward the median line of the naso-pharynx, and is to a corresponding degree removed from the neighborhood of the tube.

The ease which the surgeon possesses of making eschars with this instrument exposes him to the peculiar danger of attempting to do too much at a single sitting, and to hasten a treatment, otherwise tedious, by too often repeated or too deeply-made applications.

The wound may be the site of deposition of irritating substances in the air, of the diphtheritic deposit, and at best is the location of tenacious, clot-like exudations, which, from the very fact that they form upon surfaces exposed constantly to the incoming and outgoing air, soon become in part desiccated, and serve as sources of irritation to the surfaces already acknowledged to be in a morbid state. Whereas, if the surgeon is content to produce localized death by making firm coagula of albumen, these will be thrown off slowly (say, from three to five days), and will leave beneath them a healthy surface, which, as a rule, does not a second time form an eschar. A small surface being covered at a single sitting, permits the operator to make applications to adjacent areas, without waiting for an eschar to come off from a given surface. I have often at a single sitting produced slight eschars in both right and left nasal chambers, the roof of the pharynx and the tonsil. As a rule, however, it is desirable

to make an application to one spot only at a single sitting.

By the employment of cocoaine, the vessels can be notably constricted. In this way the soft cushiony masses of tissue can be held well out of the way (a very great advantage), at the same time, the cocoaine will exert its useful effect in obtunding sensibility. That the effect is to any extent that of a local anæsthetic, I have great reasons to doubt, but it is an exceedingly useful agent, and enables satisfactory treatments (often prolonged and tedious), to be borne by young children and nervous adults with the greatest possible satisfaction. It is curious that the cocoaine is ineffectual in some instances. The use of the cocoaine must not be forgotten in connection with the employment of high grades of heat in the electrode. I have never ventured to use it on a surface which was very vascular, without first freely using the cocoaine; for it is in every way probable that the scintillating white heat might cause free bleeding, no matter how little used, upon large uncontracted venous sinuses.

Since the weight of the handle of the electrode is considerable, it may under some circumstances be advisable to insert the electrodes (possibly one in either nasal chamber) and to touch lightly the free ends of the portions projecting beyond the nostrils with the handle of the electrode, at the time that the current is passed into the instrument by means of the interrupter. Of course, the moment the contact is made with the two poles of the electrode, there will be a flash of heat at the platinum loop which is lodged against the tissue desired to be cauterized. The advantage which is secured by applications made in this manner is conspicuous. In those patients who are unusually sensitive to pain or those who for any reason cannot properly control the motions of the head, such untoward disturbance cannot change the positions of the electrodes; for the backward and lateral motions of the head will simply break the contact between the electrode and the conducting wires. With the instrument in which the electrode and wires are firmly united (see Fig. 2), the motion of the head will often rudely disturb the position, cause cauterizations to be made in undesirable parts, and prove in every way to be annoying and unsurgical. In some instances, I have employed an electrode which retains a long, slender, flexible platinum loop, which can take any form desired by moderately exerted pressure, and which when thrust through the nose so as to touch the vault of the pharynx, will conform to the curvature of that wall, and thus enable the operator to reach a point much further back than he possibly could by a straight rigid instrument.

A great advantage of the use of the galvano-cautery is its application to the principle of the snare. It is well known that a loop of wire which is steadily narrowed has great power in severing the attachment of tumors and other outgrowths. When of a large size they may be sufficiently powerful to pass through bony structures, as well as the softer parts of the body. The principle of the snare has been employed both in the throat, the ear, and the nose; but when my attention was first directed to this subject the forms available were too large and heavy for the delicacy of manipulation demanded in removing small tumors lodged in the narrower recesses of the nose. Moreover, no snare that I could then find would permit the galvanic current to pass through the loop at the time it was being narrowed. I was led, therefore, to inquire into the practicability of an instrument which would be at once light, of small size, and yet sufficiently powerful to remove that class of hypertrophied tissues and polypoid growths which are of such frequent occurrence in the nasal chambers. The instrument shown in Fig. 3 combines these qualifications, and satisfactorily performs the service for which it was designed. The only feature of an essential character which may be said to be novel is the fact that the platinum wire (3, Fig 3) forming the snare is covered with a uniform coat of copper, except alone the portion forming the loop, which is bare. As a consequence of this arrangement the current of electricity from the battery is conducted through a double canula (1, Fig. 3) by means of the copper.

The slotted barrel (5, Fig. 3) of the instrument, including the milled screw head (8, Fig. 3) is of aluminum. The carriage (4, Fig. 3) is of vulcanite. The cables (1, Fig. 3) are attached to the carriage by a swinging pivot, the invention of Mr. Starr, of the S. S. White Manufacturing Company. The

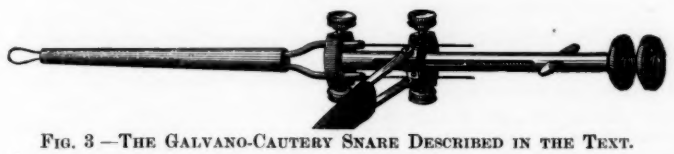


FIG. 3.—THE GALVANO-CAUTERY SNARE DESCRIBED IN THE TEXT.

weight of the instrument is less than half an ounce. The canula measures four inches in length; the aluminum shaft four inches. The length of the instrument is therefore exactly eight inches when the screw and carriage are carried well within the shank, but when withdrawn to its utmost, the length of the entire instrument is nine and a half inches. The advantages of the electrical snare over others in use are: the facility with which the small loop can be carried

FIG. 1.—TWO ELECTRODES OF PECULIAR SHAPE IN USE BY THE AUTHOR.

against a small growth not exceeding the size of a grain of wheat or corn; the ability to grasp readily the pedicle, and by a few turns of the movable nut to cut its way into the tumor, when by an application of the current, all points of resistance can be easily overcome.

### The B. T. K. Storage Batteries.

We have received a copy of a report made by Professor George Forbes, and dated March 25, 1885, in which he gives the efficiency and Mr. Forbes says: "Several of the cells were not in perfect order, and lost their E.M.F. entirely. Owing to this cause, the efficiency given above (67 to 69 per cent.) is not so high as it would have been with better cells." As this sage remark applies to batteries of every description, we can at once dismiss it without further comment. In another part of the report we observe the following: "A certain amount of bulging was noticed in some of the plates after a lengthy discharge. This would not occur with these plates when properly used." Are we to understand from this that Professor Forbes did not use the plates properly? In the next paragraph we read; "My opinion is that these cells are good, and that their performance would have been better if they had been better treated before being placed in my hands." However this may be, they were treated as if in actual employment, for the Professor writes: "I invited your employes to supply me with the charging current which they preferred to use, and I discharged at the rate which they adopt in practice." Probably from the effect produced upon the minds of the directors of the Consolidated Electric Company, Professor Forbes was requested to test another battery of 18 cells, under favorable conditions. This test was one of a single charge and discharge, and from it Professor Forbes arrives at the conclusion that the true and practical efficiency comes out 69 per cent.—*London Electrical Review.*

FIG. 2.—THE DOUBLE SEILER-FLEMMING BATTERY EMPLOYED BY THE AUTHOR.

commercial output of these batteries. Our readers will probably remember that so long ago as March of last year Prof. Forbes was engaged in examining into their working; one would therefore conclude that he has not omitted any one point which should be taken into consideration for arriving at correct results. As we shall probably deal with this subject more fully in our next issue, we will merely mention that the number of cells tested was 18, connected together in series.

In a paper on explosions of fire-damp and barometric falls, M. de J. Lebrun throws a doubt on their connection. He says that several English engineers and men of science have sought to establish a coincidence between great barometrical depressions and explosions of fire-damp, but an inspection of the tables published by the French Commission on Fire-damp does not appear to prove this. There are as many explosions at moments when the barometer does not vary and when it rises as there are when it falls.

### Diphtheria in the Chief Cities.

Deaths from diphtheria per 100,000 inhabitants in

| | | | |
|---|---|---|---|
| Amsterdam | 265 | Paris | 85 |
| Berlin | 245 | Hamburg | 76 |
| Madrid | 225 | Naples | 74 |
| Dresden | 184 | Lisbon | 74 |
| Warsaw | 167 | Stuttgart | 61 |
| Philadelphia | 163 | Rome | 56 |
| Chicago | 146 | Edinburgh | 50 |
| Turin | 127 | Buda-Pesth | 50 |
| St. Petersburg | 121 | The Hague | 45 |
| Bucharest | 118 | Vienna | 44 |
| Berne | 115 | London | 44 |
| Munich | 111 | Christiania | 43 |
| Stockholm | 107 | Copenhagen | 42 |
| Malines | 105 | Suburbs of Brussels | 36 |
| Antwerp | 104 | City of Brussels | 35 |
| New York | 91 | | |

The *Siglo Medico*, from which this extract is taken, considers Brussels a highly favored city. It is certainly so in regard to exemption from diphtheria.

In Paris an electric lamp fed with a portable accumulator has been selected, and its use made imperative, in seeking leaks in gas pipes. If used in all underground explorations this would effectually bring an end to those disastrous explosions two of which occurred in Chicago recently, severely injuring several gentlemen.

The Baltimore and Hampden Railroad, which is to be a suburban branch of the Union Passenger Railway of Baltimore, is in process of construction and is almost completed. The road starts from Huntington avenue and Oak street, Baltimore county, and passes through the villages of Mt. Vernon, Hampden and Woodberry. It is the intention of the company to use electricity as a motive power, modeled on the system in use on one of the long piers at Coney Island. A motor, independent of the cars, is being made to try the experiment, and if it is successful, it is likely that the future motors will be part of the cars. The length of the new road is 2¼ miles, and it is expected to be soon ready for use.

Brockton, Mass., is considering the adoption of combined district messenger and fire alarm system to take the place, if satisfactory, of the Gamewell system now in use. The projectors offer to place 150 fire-boxes in approved locations about the city, and a circuit of 75 to 100 bells, including a tower striker and steel bell, on which any alarm received at the central office may be struck by the operators in the houses of firemen and police. If found satisfactory, this system may be used by the city for a term of years at a low price. As the Gamewell system has but twelve boxes, the citizens of a municipality of 20,000 inhabitants feel that they are very poorly protected, and it is perfectly plain that any extension, covering the ground proposed by the new plan, would prove several times as expensive. The engineers of the fire department are the only persons who oppose the improvement.

The Westinghouse Machine Company, of Pittsburgh, report trade as opening remarkably in 1885. Their sales for the month of January were sixty-seven engines, aggregating 1,752 horse-power, which is certainly good for hard times. The electric light industry still continues to furnish plenty of business. Besides a large number of engines for lighting private establishments, they have contracted for the following public stations: The Newton Electric Light Company, of Newton, Iowa, one Westinghouse Automatic Engine of thirty-five horse-power; the Champion Electric Light Company, of Springfield, Ohio, two engines of sixty horse-power each; the Excelsior Electric Light Company, Port Huron, Mich., one sixty horse-power Westinghouse automatic engine; the Northwestern Electric Light and Power Company, of Omaha, Neb., one engine of forty-five horse-power; the Weston Electric Light Company, Lexington, Ky., one eighty horse-power engine, being the second one within two years; the Brush Electric Light Company, of Buffalo, N. Y., also order two more engines of sixty-five horse-power each.

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*We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.*

*We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.*

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NEW YORK, MAY 16, 1885.

CONTENTS.

| | PAGE |
|---|---|
| Bollmann's Dynamo | 1 |
| Electricity in Medicine | 2 |
| The B. T. B. Storage Batteries | 3 |
| Editorial Notes | 4 |
| Can Market Rates be Fixed by Statute | 4 |
| Aiding our Friends with a Few Hints | 4 |
| General Western News | 5 |
| Important to Electric Light People | 5 |
| The American Edison Alliance | 5 |
| Telephonic News | 6 |
| Telephones of the World | 6 |
| Changes in the Cumberland Telephone Co. | 7 |
| Telephone News from Kansas City, Mo. | 7 |
| Early Telegrapy | 7 |
| Electrical and Scientific | 8 |
| The Edison Company's Suits | 8 |
| The United States Company's Suits | 8 |
| Electric Light News | 9 |

We are able to give our readers, through the courtesy of Mr. Otto Gruninger, 19 Whitehall street, this city, a complete description of the Bollmann dynamo—referred to briefly in our edition of April 18th

The Star Iron Tower Company, of Fort Wayne, Ind., have this week sent post-paid to every electric light company in North America, one copy of the American Electrical Directory. Any company failing to receive the book will confer a favor on the publishers by notifying them of the fact.

In England, a telephone company announces as an inducement to new subscribers that their telephones will be "switched on" to the opera circuit occasionally, free of charge; and further, that for a *small expense*, they can have access to the church circuit, he one that receives and transmits Sunday sermons. This would indicate that sermons are more expensive than symphonies, and that the believer in England is beset with temptations the bankrupt Patti devotee on this side would fondly embrace. If the "small expense" is to take the place of the contribution that the churchgoer avoids by use of his telephone, and is turned into the church treasury, well and good, but we confess a doubt, and fear a feeling will arise on the part of the ministry prejudicial to this great convenience to stay-at-home laymen.

An important fact (if it be a fact) is the recent semi-official announcement that the American Bell Company contemplate a reduction of rentals now charged to their subordinate companies. During the recent hearing before the Mass. Legislature regarding the rates charged by the Bell Company a report was started, which we understand they partially confirmed, that the Bell propose to reduce prices charged the New England Company for telephones used in the country districts. Of course if a reduction is made to the New England Company similar ones will have to be made to all companies throughout the country. It is understood that the reduction will be made on a sliding scale; for example, to exchanges in places containing a certain population the rate will be $8 a year per set, instead of $14 as now charged; this price to be increased respectively to $10, $12 and $14 a year per set, according to population. This would seem to be a step in the right direction. Whether we shall hear anything more about it after the Massachusetts Legislature adjourns remains to be seen, but one thing is certain and that is, unless some concessions are made to many of the sub-companies the future peace and prosperity of the parent company will not be what it has been in the past. To say that the Bell Company have heretofore done anything to encourage in the sub-companies the hope of a concession would we think be difficult to substantiate and licensees can expect but little from the parent Company until the latter is fully assured it is necessary. Certainly a more opportune time will never come.

The Boston *Globe*, of 14th instant, in an article regarding the New England Telephone Company, says some additional facts have been gleaned, which will be of interest to stockholders and others. It was given out that the American Bell Company would allow the outside stockholders to name the fifth or odd director on the New England Board, but the action last Friday would seem to contradict this entirely. The odd director, H. S. Hyde, of Springfield, who takes the place of Mr. Cochrane, is not a New England stockholder, and is a strong friend of the American Bell Company, by whom he was named and elected. Mr. Parker and Mr. Ayer are said to be large holders of American Bell stock, and have always been very friendly to them. Mr. Glidden was elected with the distinct understanding that he should resign to make room for another American Bell man as soon as they (the Bell Company) could find one they wanted, thus leaving the Board more firmly in the hands of the Bell Company than it was last year. It will thus be seen that the magnanimous talk of the Bell Company about giving the New England stockholders the odd director was all for effect, and was never contemplated. It is intimated that one reason why Mr. Ingham was not acceptable to the officers of the Bell Company was because he had on one or two occasions gone to them and insisted that they could not afford to take dividends on their franchise stock, and collect royalties on their telephones at the same time, and that, unless some concession of this kind was made to the New England stockholders, it would be impossible for the New England Company to ever pay satisfactory dividends, and he also intimated some time ago that he should, as a member of the Executive Committee, oppose certain changes and the experiments, which he believed were expensive and unnecessary.

## *CAN MARKET RATES BE FIXED BY STATUTE?*

If, under a republic, all measures were decided by the bawling of the rabble, then he who had the largest mouth would have the most influence and a government of, for and by the people, would assuredly be fit only for barbarians, and constitutional monarchy might be hailed as a boon by all save tramps and professional paupers. Happily for us, however, we have proved to the skeptics of the old world that law and order can prevail under a republic as well as under a monarchy; that neither political pressure nor public clamor can blind the eyes of justice or overbalance her scales. This being the case the most humble citizen can hope to have his wrongs redressed with the same certainty as his richer fellow citizen, and no matter how rich a corporation, nor how many enemies it may have made among the envious by its success, it has nothing to fear from violence or injustice. This was shown last week in the defeat of the gas bill. The general public, always unreasonable when other's rights are at stake, backed by a portion of the press—the unthinking portion—demanded that the Legislature should control the price of gas. Now we have absolutely nothing to say as to the price of gas, whether it is too high or too low. That it not the question. The question is, can the Legislature legally interfere with the price of marketable products? If it can fix the price of gas, it can fix the price of corn, sugar, copper and rice, and instead of, as heretofore, being controlled by the laws of demand and supply, the market prices for the various commodities may be controlled by the Legislature. This was the principle at stake in the gas bill discussion, and the defeat of the bill in the face of the great influence behind it shows that even the members of the Legislature are reasonable beings when given time for reflection—a fact that their behavior at times has caused us to seriously doubt.

We have been led to this discussion by reason of the following publication in the Albany *Journal:*

"CURBING THE TELEPHONE MONOPOLY.

A bill has just been passed by the Legislature of Indiana, and has been signed by Governor Gray, which provides that hereafter the rental of a telephone in that State shall not be fixed at a rate higher than $3 a month, and that if any customer uses more than one telephone the rental shall not exceed $2.50 for each. The bill also limits to a fair rate the cost of using telephones for transient business. The new law is very brief, but it appears to cover the matter completely. It was presented, we are told, in answer to a general demand on the part of the people of Indiana for relief from oppressive rentals enforced by the telephone monopoly. This same oppression has been felt in New York State so strongly that in Utica and in some other cities telephone subscribers have organized associations and pledged the members to give up their telephones if rates are not reduced. We understand that a bill similar to that passed by the Indiana Legislature will be introduced in the Legislature to-night and urged to a speedy passage."

Of course such legislation as this alleged to have been had in Indiana cannot stand, because it is unconstitutional, and therefore void. If the local telephone company had tried to compel any one to use its telephone against his will, it would have been a high-handed outrage. But, on the contrary, the company says: "We want such or such a price for the service we have to sell," just as the grocer says: "I want 30 cents a pound for this coffee." The customer is not compelled to buy the coffee. He can object to the price and depart. But if he takes the coffee he must pay the price demanded, and not even a legislature has the legal right to cheapen it for him.

We are are not informed of the truth or falsity of the allegation that telephone subscribers in Utica or other cities had banded themselves together to obtain lower prices for service, but, if such is the fact it is not because the rates of service are exorbitant, but because of the hopes begotten of the recent gas bill discussion.

It is curious to examine into the business methods of those who are first to cry "monopoly!" It is a notorious fact that the majority of those pressing the passage of the gas bill are the most exacting business men and operators. The principal officer is a large real estate owner who is known in dealing with his tenants to exact his pound of flesh every time. Is it or is it not so "nominated in the bond?" is the principle he works on, entirely correct, too, from a business standpoint, and one which we have nothing to say against. But suppose he was told that he asked too much for his apartments, that his exorbitant rates were to be made the subject for legislative investigation and action. How indignant he would be? We don't know these Indiana telephone subscribers that have got the Legislature to illegally interfere with the companies, but we dare say that like business men and dealers generally their ideas are somewhat small as to what they ought to pay for their goods, and inclined to inflate as to what they should get for them.

## *AIDING OUR FRIENDS WITH A FEW HINTS.*

It is often surprising and sometimes amusing, in looking over our exchanges, to see how long it takes some of our friends to recognize what is passing under their amiable noses. Here, for instance, is our esteemed and always readable contemporary, the *Iron Age*, asking—and only last week—why no attempt is made to introduce the electrical motor on the elevated railroad. It says: "That the introduction of electric motors on the elevated roads in this city, for example, would be a vast improvement over existing methods, and add greatly to the comfort and convenience of all concerned, must have been recognized long ago, and yet all measures tending toward a satisfactory solution of the question have thus far been thrown aside."

This reminds us of the old fellows in the wilds of Pennsylvania, who, it is said, are still voting for Andrew Jackson.

Now, when our esteemed contemporary is talking about *iron*, or possibly about *age*, it is unfailing; but when it tackles the electrical motor business, it loses its reckoning, and ought to heave over its mud hook, as the sailors say, until it can take a few observations for latitude, longitude, and make a few simple corrections for semi-diameter, dip, parallax, and refraction.

Now, the fact is, preparations for the operation of two electrical railroads have been for months going on on the New York elevated railroads; one system has possession of the Second Avenue line from Chatham Square to the Harlem River, and the other of the Ninth Avenue line from Fourteenth Street to Fifty-third Street; and perhaps this very week one or the other of them will begin running, for such is their intention.

Again, here is our neighbor and contemporary, the *American Machinist*, always accurate when speaking of its specialty, going on in this manner: "There is no denying that at best the steam engine is a wasteful vehicle for transforming the potential energy of carbon into useful work, but there seems no near prospect of a more economical substitute being found The belief entertained by certain scientists that electricity will eventually be obtained direct by the oxidation of carbon is a mere speculation. No discovery has been made that indicates any probability that electrical energy will ever be derived direct from coal; and the chances that it may eventually be done are very remote, quite as unlikely as that the steam engine may be improved till 80 per cent., instead of 12 per cent., of the potential energy will be utilized."

Now, while it is true that no means have yet been found for obtaining electrical energy directly from coal, it by no means follows that therefore the steam engine will not be superseded for a more economical substitute, for the reason that electrical power can now be generated on the banks of running streams and at the coal pits where fuel is cheap, and be transmitted some distance; and the improvements made in this system are so continual, and the demonstration of the correctness of the theorem so plainly in sight, that we beg leave to point out the fact to our estimable contemporary, with an apology for contradicting his assertion that there seems to be nothing in sight likely to interfere with the steam engine, even when recovering only 12 per cent. of the theoretical power of coal.

## *GENERAL WESTERN NEWS.*

Whether it is the outcome of second advent inspiration, originating among the muslin-robed saints of Massachusetts—who performed a *sans culotte* dance the other night in anticipation of the coming end of the world—the wisdom of the Salvation Army, or the insanity of spiritualistic mediums, is uncertain; but if what has been stated is true, a total revulsion of all electrical science is imminent, and evidence is at hand to show the shallowness of brain and scientific imbecility of every electrician, from the head to the last bummer at the tail end of the grand procession.

The new theory is startling, and bristles with most astonishing statements.

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There is on exhibition here, sent to the city electrician for tests, a new and wonderful wire, which at first sight bears so perfect a similarity to a safety fuse that primarily it suggested dire possibilities of dynamite and ruin. Subsequently it became apparent that what at first seemed powder is only innocent carbon, which, after a proper length of time underground, is warranted harmless for mischief.

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The new wire comes from the East, and has peculiarities which have hitherto been unknown in this connection. The section referred to has a linear measurement of half a mile. The copper wire, which is considered by the inventor as a secondary affair, is a No. 28 Brown & Sharpe, and is surrounded by powdered carbon, and this in turn by wrapping, and an outer insulation of what seems much like oakum. The resistance of this sample is 400 ohms, or 800 ohms to the mile.

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The insulation resistance, the spool containing it lying on the shop floor, and the leak being through the insulation, the hand and body of the party testing to the floor, 500,000 ohms.

But insulation is not the inventor's best hold. He has discovered that carbon is a conductor of that peculiar nature which is competent to do away with induction. The earth is the only conductor which can completely subdue this "electrical tramp," and carbon is the next best material. The carbon, too, has another special property, which has hitherto been hidden beneath a bushel, and which is one of magnificent proportions. It has the singular faculty of fishing up and appropriating electricity when there is a current traversing it, and thus not only supplying any lost current, but actually increasing the battery impulse, so that at the end of the route there is more force than was originally sent to line. It acts something as linsey woolsey trousers do when a boy is chasing a calf through a briar patch, or an Indian pony's tail operates among burdocks. According to the theory, this wire, to sum up its qualities, which are the nearest approach to perfection yet reached, it does away with induction, it accomplishes by renewal the effects of leaks, thereby rendering long distance telephone, telegraph, and electric light circuits practical and easier than short ones, and at the same time cheaper; and it knocks Sir Wm. Thomson's formula for finding the most economical weight of metal for the transmission of electrical power silly and cold, inasmuch as only wire enough is required to insure connection and bridge over faulty spots in the carbon core.

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The Western Electric Company have recently finished a counting machine for New Orleans, which is something of a novelty. The frame, about ten feet high, a square column paneled on the four sides, resembles a grandfather's clock, in a glass frame at the top of which are three vertical wheels, with four-inch figures, arranged to show consecutively any combination of the three digits. These wheels are actuated by a heavy weight within the column, which is controlled by battery current through the medium of a key worked by hand. Having reached the limit of its capacity, or if from any other cause it is desirable, a second key restores the wheels to zero. Whether this machine is for counting councilmen's votes or recording base ball misses, or doing some species of witchery on the board of trade, is one of those things no fellow can find out; and in this mystery lies much of the interest which has been betrayed in the machine. It works rapidly and neatly.

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The same company has an exhibit of a combined system of arc and incandescent lights from the same dynamo. The latter circuits are run on the three wire system, the two outer conductors leading from one pole, while the center wire is attached to the other. The lamps are connected in multiple arc from either side to center wire, so placed as to produce a current balance. The lamps are of the Stanley form. At the point where the group connects to the main wires from the dynamo a solenoid, differentially wound, is inactive while the currents through the two branches are equal; but once this balance is disturbed by any disarrangement of the circuit, the core of the magnet is acted upon, and by its movement opens the circuit and extinguishes the entire group. The arc lamps used in this combination are the Western Electric's own invention and manufacture.

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Mr. C. D. Shain has severed his connection with the U. S. Electric Lighting Company here, and accepted the general agency of the Stanley Company, with headquarters in Chicago. When last seen, Mr. S. was "russling" around to find an office, and expects to be located, ready for business, in the course of another week or so.

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Opperman Brothers, in very cramped quarters on Market Street, are manufacturing incandescent lamps to fill orders which have accumulated during several months past. They are hoping to occupy more generous premises shortly, when they will increase their facilities and open out on a more extended scale.

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The Edison people took the first of May fever and vacated their old quarters on Wabash Avenue, going into the new Adams Express building, 185 Dearborn, just south of Monroe Street. The new offices, shops, etc., are all on one floor now, which they claim will prove a positive advantage.

And the United States folks have gone into their new office in the Northwestern Insurance building, near the Board of Trade, on La Salle Street, occupying quarters which are a decided improvement on those vacated.

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The Sperry people have now in the new Board of trade two 10-light arc dynamos, and their full quota of lamps. In addition to these, there is to be another of the same sort, with wires to the tower of the building, a group of 10 arc lamps to be lighted all night for the benefit of the outside public. The Edison plant in this building numbers 756 lamps.

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It was, in the opinion of very many, a great mistake on the part of some one in authority that a time ball had not been arranged for, to be dropped at noon each day, by the Board of Trade people. There are so many who are governed entirely by the time of the Board, who could see this signal at a distance, and the Board itself is so anxious to be considered authority in the matter of time—has taken so much pains to provide an accurate four-dial clock for the tower—that it does look like a great omission on the part of the management to ignore the giving to the public for miles around the building correct, reliable time at noon six days in a week, and thus make for the Board of Trade building a reputation which it is desired it shall have and hold. The clock is all right, as far as it goes, but a falling ball can be seen far beyond the hands on a clock face; and at shorter distances, standing at an angle of 45° from either of two faces, one cannot read the time on either of these.

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In the matter of charges for telephone rentals, about which there is so much agitation just now, there are one or two points which the public either will not or does not thoroughly comprehend. Firstly, the value of any telephone service is in direct proportion to its magnitude. A line in an exchange with fifty or a hundred subscribers is of comparatively little consequence to a business house, where there are hundreds who cannot be reached because of their being non-subscribers, and the money value of the service is a minimum. It is as if a post-office possessed mail facilities through only one township, county or State. The narrow limit of its service would make it comparatively valueless. But extend those facilities over the globe and the value to civilization is incalculable.

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It may be said of this illustration that it proves too much for the telephone question, in that the price of mail facilities does not increase with increased range and accommodation. That parallelism is unjust, inasmuch as the one is a matter in which a company is stakeholder, and is pursuing a legitimate calling for a living, and without a reasonable profit cannot continue the business. The Government is differently situated, and is not expected, even by the members of the firm—of which the reader is one—to be doing business at a profit, for if it does, you and the rest of the stockholders must make up the balance-sheet deficit.

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Then, again, in proportion as the number of subscribers to an exchange system increases, and it becomes of more value to the subscribers already in—because of its increased range and facilities—so do its working expenses increase.

When there are, say, 100 subscribers to an exchange, each one of these may at anytime call for any one of the other 99. Then, if each of 100 subscribers can call for 99 others, the total number of calls possible in that exchange is $99 \times 100 = 9{,}900$. Suppose, now, we have an exchange with 200 subscribers. As before, each individual has it in his power, and is entitled by his contract, to call for any one of the 199, which, with the instrument he is using, makes up the list. But $199 \times 200$=as the number of calls possible 39,800, or more than four times the possible calls for the first exchange, which is half its size; and if we double it once more, an exchange with four times the subscribers of the first will have risen to a capacity of 159,600, or 399 times 400, over 16 times the capacity, with only four times the lines; and when these lines are increased in number until, like the Chicago, New York, and some other exchanges, they have risen above 3,000, some idea of the increasing value of exchanges to subscribers, pro rata for increased connection facilities, may be estimated.

And while the individual subscriber never does and never will have use for all his fellow-subscribers, his necessities will be accommodated, on the average, in about the the same proportion as the facilities are increased by the growth of the combination.

But with increased facilities, entailing, as it does, increased duties at the central office, the pay-roll of the exchange keeps pace and increases in the same sort of arithmetical progression, so that while a single operator in a small exchange may be able to handle a certain number of wires satisfactorily, and read the papers beside, the same number of lines may require two or three operators in an exchange of greater dimensions, and if the Indiana legislature managed the exchange its shadowed policy would reduce pay to a figure that would prevent the three combined from buying a newspaper, and keep them from reading one if it was donated to them.

And thus we see why telephone service is more expensive in the city than in the country—and also why it is worth more to the subscriber, who pays less pro rata for service in a large than in a small exchange.

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The cable house at the north end of the La Salle Street tunnel under Chicago River here, took fire on the 8th inst., and completely cut off all the telegraph, telephone, and district wires, destroying the entire structure, so far as usefulness is concerned. By this catastrophe all the telegraph circuits running directly north from the city were broken. The city fire and police lines, fortunately, were placed under ground some time since, and were consequently unharmed, otherwise an immense deal of damage might have resulted from the North Division being cut off from the central station. This is another cogent argument in favor of underground wires.

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T. D. Lockwood, of the Am. Bell Co., was in this city several days last week, gathering information of the early days of the telephone business, preparatory to writing up the tribulations and inventions of the pioneers—a history of telephone childhood and its infantile diseases, with the remedies administered by local physicians, as it were.

Chicago.

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The Mexican Central Telegraph and Telephone Company held their annual election on Wednesday, May 13th, 1885, at 38 Pine Street, this city. The officers elected were John Weed, president; Geo. William Ballou, vice-president; Hammond Hunter, secretary and treasurer. Directors—John Weed, Charles O. Morris, Hammond Hunter, of New York; Geo. William Ballou, of New York and Boston; William Reed, of Boston. There were 38,100 shares of stock, out of 45,000, represented at the meeting.

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### Important to Electric Light People.

We are informed that the Boulton Carbon Company, of Cleveland, Ohio, have recently secured the sole agency of the celebrated Austrian cored carbons, for the continent of North America. These carbons are particularly adapted to those arc lights which burn with a short arc, entirely obviating the hissing noise frequently noticed in those lamps. It is thought there will be quite a demand for these carbons, where an absolutely noiseless and steady arc light is required. The Boulton Company manifests its usual energy and enterprise in securing the agency for these carbons, thus placing themselves in position to furnish their patrons with all varieties of carbons. The electric light people will undoubtedly appreciate this action of the Boulton Company, as it will enable them to purchase these celebrated carbons in this country, at reasonable prices, instead of importing them direct from Europe, as heretofore, which has not been satisfactory, especially in those cases where purchasers wanted but a small number.

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### The American Edison Alliance.

In the brief announcement which was made in these columns, based as it was upon incomplete information concerning the nature and the scope of the recently effected alliance between the new American Electric Manufacturing Company and The Edison Electric Light Company, both of this city, it was not possible to state the exact facts fully, or to point out their magnitude and importance. In the first place it should be distinctly understood that the American Electric Manufacturing Company is, in effect and fact, the American Electric and Illuminating Company transferred to New York, *and a good deal more.* The new company absorbs and succeeds to all the business and assets of the American Electric and Illuminating Company, has the same vigorous and efficient head as President and General Manager, and has the whole territory of the United States to operate in instead of the "pent-up Utica" of New England. It has an exceedingly strong board of directors, representing brains, money and experience, and it enters upon its work in the new field with characteristic energy and "snap."

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The annual meeting of the institute for the election of officers to serve during the year 1885-6, and for the transaction of other important business, will be held at the House of the Americrn Society of Civil Engineers, 127 E. 23d street, New York City, on Tuesday, the 19th inst., at 8 P. M.

The first general meeting of the year 1885-6, for the reading of papers and discussion thereon, will begin at 10 A. M. on Wednesday, the 20th inst., at the same place, when several interesting papers will be submitted.

## Telephonic News

*** The old block pavement in State St., Boston, is in a condition dangerous to vehicles—the first fruits of burying the telegraph wires.

*** Edison bids fair to throw the Bell-Drawbaugh litigation in the shade. As the electric light was much more of a growth than was the telephone, questions of its priority of invention will be much harder to settle.

*** The constitutionality of the bill passed by the Indiana Legislature, reducing telephone rentals to $3 per month, with a further reduction of 50 cents where two or more instruments are used by the same firm, will be tested in the Supreme Court of Indiana, probably this week.

*** Frank G. Beach, general superintendent of the Central Union Telephone Company, and his wife are enjoying a New York visit at the St. James. Mr. Beach received warm welcome from his many Eastern friends, who were glad to see that his many telephone cares had not impaired his good looks and cheerful demeanor.

*** There is a total of 247,720 miles of new line work projected in America by the telephone interests—a length greater than the mean distance between the earth and the moon. The trouble in getting to the moon, however, is found not so much in securing the right of way—there is the Milky Way, for instance, which is unoccupied—as the difficulty discovered in digging post-holes and locating guy stubs.

*** A new central office system is being placed at Atlanta, Ga., where there are already 610 telephone patrons. As soon as the new office is completed, which will have facilities for 1,200, the exchange will increase rapidly, as the names of a number of applicants are on file. This exchange is in the territory of the Southern Bell, a company that has expended a considerable amount in construction and general improvement.

*** In Alabama the city of Birmingham has 230 telephone subscribers, Montgomery, 175; Mobile, 145; Columbus, 120. In each of these cities there is a gradual increase as the Southern people become better acquainted with the advantages of the telephone. The colored people have not subscribed liberally to telephone usage up to the present time, and as many of the Southern cities are inhabited largely by them, the growth of Southern exchanges is necessarily slow.

*** At a meeting of the directors of the New England Telephone and Telegraph Co., held last week, the resignations of Messrs. Ingham, Glidden and Parker were accepted. Subsequently a committee of five, consisting of Messrs. Ingham, Salisbury, Ayer, Parker and Glidden, was appointed to nominate successors, and nominated Messrs. Hyde of Springfield, and Glidden and Parker of Lowell, and they were elected.

The news of the resignation of Mr. Ingham has caused a feeling of sorrow and regret among the many employes of the company, by whom he was universally respected and loved.

*** E. L. Smith, of Kansas City, Mo., superintendent of the Missouri and Kansas and United Telephone companies from the date of their incorporation, resigned on May 1st, and will identify himself with the electric time business, with headquarters in the West. Mr. Smith has been an important actor in the advancement and improvement in the telephone interests of the States of Missouri and Kansas, and the energy and ability which characterized his work in the telephone field will undoubtedly win him deserved success in his present one. The electric time interests will have secured a reliable and valuable promoter in Mr. Smith.

*** It is not expected that the application of the American Bell Telephone Company to the Massachusetts Legislature for increased capital stock will be granted.

*** The Baxter Telephone Company has brought suit to collect certain of its rentals in Philadelphia, but is met with the defendants' statement that they had notified the Baxter people that they didn't want their telephone.

*** An invention that is expected to do away with the power and hand generators, pole changers, etc., etc., at central telephone offices, will soon make its appearance from the Patent Office and will be received with loud applause.

*** The Columbus (Ohio) Telephone Exchange is putting up one-hundred-wire cables. These cables are found to work well for telephone conductors, and are a decided improvement over the one hundred wires, which would occupy the space of at least ten cross-arms.

*** "Do you need any telephone line wire?" inquired the salesman of the general manager. "No, we have all the telephone line we need;" and the general manager glanced at the solicitor, who was explaining to the new subscriber how the telephone worked, as though he thought the truth was not in him.

*** Fred. W. Watkins, president of the Mutual Telephone Company, has made an assignment. He was the chief owner of the telephone company, which is a capitalization of territory rights for New York and Pennsylvania on an acoustic telephone, and it is said he furnished most of the $30,000 required to purchase the franchise.

*** The Plymouth, Eng., patrons of the telephone exchange are to have all the advantages of operas and sermons without leaving their homes. The telephone company has decided that subscribers shall henceforth have the privilege of being "switched on to the theater on any evening when operas or entertainments in which music plays a prominent part are being performed." The company also announces its willingness to connect at a *small cost* any place of worship with the home of an invalid, so that the services at a church or chapel can be participated in by those who are unable to leave their homes. Many will doubtless avail themselves of this benefit; but why, we would ask, is there a "small cost" for sermons and free access to operas? Does the English mind prefer the former, and by this means does the company expect to secure greater returns?

*** "It is not a question of expense that deters us from putting our wires underground, but a question of practicability," said Mr. Sargent, of the New York and New Jersey Telephone Company, when interviewed concerning Senator Daly's bill providing for "placing electrical conductors underground in the cities of this State, and for commissioners of electrical subways" He added: "We have 250 miles of wire in fifty and 100-wire cables under the streets of Brooklyn, and though only ten per cent. of these wires have been tried as yet, the underground system for short distance has proved satisfactory. But the greatest length of any of those wires is only 2,300 feet, and the difficulties would more than proportionately increase with the lengthening of these underground cables. Why, look at the experiments in Europe. For thirty years trials of all kinds have been made in London under governmental supervision, and even yet no satisfactory general system has been decided on. As to expense, there is no doubt that it would be very great, between four and ten times as much as putting wires on poles. We have not decided on what particular underground system to adopt should the law force us to act, because no system has yet been found to work at long distance. Just a few months ago a company made a proposition to us to lay underground cables, that we agreed to take should they work satisfactorily. The cables were put down, but they wouldn't work."

*** Worcester, Massachusetts, is enjoying the moving of the central telephone office. Hereafter the calls will all be by number instead of by name of the subscriber, as it has been in the past. Numbers have been substituted for names in all exchanges of any size, and in every case the change has benefited the subscribers and the work of the central office.

*** A Boston exchange says that some friends of the American Bell Telephone Company advise withdrawing the petition for an increase of capital from $10,000,000 to $20,000,000, unless the legislature is disposed to grant the authority willingly. The company can get along without the increase this year, having funds in hand to continue experimenting upon long distance lines, and can, if it needs more money, organize a company in some other State for this purpose. It is by no means certain, however, that the legislative committee will not report a permissive bill. No reason has been given why it will not, except a reason which reflects dishonor upon the whole legislature. If the American Bell Company is obliged to buy off opposition at the State House, as has been hinted, in order to obtain what it seeks, the company will be better off without the added capital.

*** No. 15 Cortlandt street, this city, seems to have become decidedly popular as electrical headquarters. A little over one year ago F. B. Knight, as general agent of the Palmer Wire Company, opened his offices there, and for a long time his pleasant rooms were the only ones in the building occupied by an organizaton interested in the electrical field. These offices with additional ones are now occupied by Lytle and Company, and on the 1st of May the New York and New Jersey Telephone Company, the New York and Pennsylvania Company, the Hudson River Telephone Company, and the Empire State Telephone Company, all moved into the same building, from the Western Union building, and occupied spacious and comfortable quarters. The American Telegraph and Telephone Company (long distance telephoning) have also established headquarters in the same building.

*** Manager Uline, of the Hudson River Telegraph Company, has effected the purchase of the entire Schoharie County plant, owned by C. C. Cromer. This purchase, which comprises 130 miles of line, and twenty-five stations in various parts of the county, gives the enterprising Hudson River Company thorough connection of its own, and the line will be rapidly extended to Gilboa, Oak Hill, Cairo, and so to Catskill, making two complete circuits. The territory gained will add greatly to the facilities offered by the company to its patrons. On Wednesday Manager Uline perchased 75 miles of copper wire, with which a large force of men will begin, the first of next week, to run from Catskill to Saugerties, Kingston, Rondout and Newburgh. In connection with the balance of the line in position, this will make one of the longest copper circuits in the State.

*** In the receiver of M. A. Neumayer the magnet is formed by five small bars of the best quality of English steel. In order to obtain an increase of mobility in the magnetism, the inventor employs a bundle of very fine iron wire in connection with the pole nearest to the membrane. Towards its center this bundle is soldered to a brass socket, a small part of which makes good contact with the magnetized rods, while the other part supports the coil, which has a resistance of about 100 ohms. To avoid the variations of distance, which are in effect variations of temperature, between the pole and the diaphragm, he has a plate of brass soldered to the center of the bundle of wires, to screw upon the box carrying the vibrating plate; this box is of brass, and the diaphragm, of a thickness of three millimeters, rests upon a breadth of two millimeters upon the upper part of the box. The magnetized bars are maintained in a brass ring, which has a corresponding number of grooves.

## Telephones of the World.

THE NUMBER USED ON THE VARIOUS CONTINENTS—WONDERFUL GROWTH.

We publish in this article facts and figures that cannot fail to impress every reader with the magnitude of the telephone business of the world. Ten years ago to have ventured to speak of the telephone as among the possible achievements would have held the author up to ridicule, and at that time it occupied a place in the thoughts of no one outside of a few earnest workers in the laboratory. To-day it is used in all the civilized countries of the globe, and its wonderful work accepted without thought or comment. To-day there are not less than 140,000 complete sets connected with the telephone exchanges of the United States, carrying over 750,000 daily messages. In addition to this if we consider the number in use in all the other countries of the world, the growth of the telephone business in so brief a period will be found to be without parallel. This growth has not been an unnatural one, but was and is the logical outcome of the practical utility of the telephone as applied to every-day life. If we think for a moment of the thousands of miles of wire and of poles, of the thousands of dollars' worth of central office appliances, of the vast number of people employed and the vitality it has given to the inventors' work, we can partially appreciate the wide-reaching results of this invention. The telephone in itself was the chief corner stone, and then came the innumerable inventions to aid in its application. It is claimed as a physiological fact that *ten times* more brain tissue has been expended in securing the present perfection of the use of the telephone than that which brought forth the instrument itself. It has annihilated time and space, and is yet but an infant of nine years with boundless possibilities. What heights it may yet attain we only may conjecture. If within ten years from to-day the merchant in San Francisco can converse with his London agent, it is not likely that any surprise will then be manifested; and although to-day there are apparently insurmountable obstacles to such an achievement, to-morrow it may be possible.

On the 1st day of April, 1885, the city of New York had 5,115 subscribers to its telephone system; Chicago comes next with a total of 3,380; Boston, 2,626: Cincinnati, 2,550—a most excellent showing when it is considered that it is a city of but 250,000 inhabitants; Philadelphia, 2,261, and 731 private line instruments; Brooklyn, 2,200; Baltimore, 1,981; Pittsburgh, 1,700; San Francisco, 1,700 (estimated); Cleveland, 1,685, and 322 private line instruments; Buffalo, 1,540; St. Louis, 1,485; Milwaukee, 1,380; Washington, 1,234; Kansas City, 1,020; New Orleans, 1,000 (estimated). All these figures are brought down to April 1st. In all cities there are a great number of private line instruments of varying numbers not included in above figures. Of the many other cities of the United States there are exchanges ranging from 20 subscribers to 1,000, the total number being probably 140,000 comprised in 800 exchanges, with a wire mileage of 137,300.

In other countries such figures as are obtainable are given, and show a remarkable growth, but not in any nation equaling that of the United States. In Mexico, 17 cities, there were on April 1st, 1885, 3,200 subscribers, 643 of which were in Mexico City; 171 in Guadalajara. Other cities of Mexico as follows: Guanajuata, 83; San Louis Potosi, 97; Zacetacas, 72; Queretaro, 43; Agnes Caliento, 31; Guadaloupe, 23, and some 2,000 in the other cities of the Republic. Seven cities of Brazil show the following: Rio de Janeiro and suburbs, 1,675; Pernambuco, 275; Babia, 245; Para, 75; Santos, 135; Companas, 145; San Paulo, 185; other places, 250, a total of 2,985. Besides there are 350 infringing instruments, not of the Bell patents, making a total in Brazil of 3,335. In Buenos Ayres there are 1,355 Bell instruments in use, and 1,250 of other kinds. Montevideo, 750 Bell instruments, and 450 other kinds. Rosana, 300

Bell instruments. Other cities of the River Plate country (Argentine and Uruguay Republics) 150 of the Bell, and 300 of other makes. This aggregates a total in the River Plate of 2,555 of the Bell instruments, and 2,000 of other kinds, in all, 4,555. In Chili, Peru and Ecuador, five cities possess 850 subscribers, all Bell instruments. Venezuela, four cities, 635. U. S. of Columbia and Panama, four cities, 246. Central America, Guatemala, 100; other cities, 143. In the the West Indies, Havana has 356 subscribers, and other ports of Cuba, 250; Port of Spain (Trinidad) 190; Bridgetown (Barbadoes) 175; Kingston, (Jamaica) 76; Ponce, (Porte Rico) 19.

In European countries there is a continued increase in the number of instruments in use, and we give as far as obtainable the figures to date. In Great Britain, London has 3,720; Liverpool, Southport, Manchester and Blackburn together 3,000. In Italy ten cities have telephone facilities with 5,740 patrons. In France twelve cities have exchanges with 6,080 patrons. Belgium has 2,680 subscribers in five cities. There are 53 cities with telephone exchanges in Sweden and about 8,000 subscribers, a rapid increase from 1882 at which time there were less than 1,500 subscribers. In Holland there are 2,100 subscribers in eight cities. In Switzerland there are 30 cities supplied with a total of 4,150 telephones. Russia shows 2,800 subscribers distributed among eight cities. Ten cities in Austria use the telephone, and there are 820 subscribers in Vienna. In Norway there are 1,100 subscribers to telephone exchanges. In Portugal there are 600 subscribers. Copenhagen, Denmark, has 840. Spain is just introducing the telephone, and there are excellent prospects of rapid growth. There are now 85 subscribers in Madrid. There are 1800 users of the exchange instruments in Berlin, and the telephone is popular in all cities of the German empire. In New Zealand there are 1,100 instruments in use—a first-class showing for this island.

### Changes in the Cumberland Telephone Company.

Mr. E. S. Babcock, Jr., of Evansville, Ind., has resigned the presidency of the Cumberland Company, on account of ill health. In a recent interview, he spoke of the change as follows:

"I have no hesitancy in making all the facts public, if the people are concerning themselves regarding me and my movements, although there is nothing in which they can have any possible interest. My health has necessitated my retirement from active business; besides, I am building a residence at San Diego, Cal., where I intend to live. I have resigned the office of president, but will still remain in the Board of Directors as vice-president. Mr. O. F. Noel, of Nashville, will succeed me."

"Is that the only change?"

"No; Mr. Lennehan, an Evansville boy, will succeed Mr. Baker, who has resigned the secretaryship. Why these rumors are set afloat, I am at a loss to conceive. There has been no changes made except upon mutual agreement. The company will continue just as it was, and Mr. Paul J. Marrs will be general superintendent. You can say for me that ill health and a desire to retire from active business life, until I am very much improved, at least, is the sole reason for any change."

Mr. E. T. Baker, who has resigned the secretaryship, was an excellent official, and a more competent man for the position it will be difficult to find.

.... The cables carrying the telegraph wires through the Arlberg tunnel are four in number, carrying in all 14 wires. They weigh in the aggregate more than 150,000 pounds, and cost nearly $50,000. Two of them are cased in iron and one in lead; these are carried in a carefully protected channel below the level of the track. Only the fourth, which serves to give railroad signals and carries but one wire, is suspended above ground.

### Telephone News from Kansas City, Mo.

KANSAS CITY, May 6th.—The office of the manager of the telephone company here has been fitted up and now looks business-like and nobby. It is occupied by the manager, D. B. Macquarrie, and his chief clerk, J. W. Ebert. The ante-room has been given up to the inspectors, three in number, C. W. Gandy, A. D. Hawk and J. H. Flynn, and also lineman W. C. Moore. The boys are supplied with tables and chairs, and a hook for each to get his trouble from. None of the inspectors are permitted to enter the operating room, unless sent there by the manager. Besides the instrument work they assist in collecting rentals. Each has his own territory. All the bills when made out at beginning of quarter are assorted, and each inspector collects those on his division. This plan works well. Two or three messenger boys are employed to collect toll line bills, the plan being to collect by the tickets kept by the toll-line operator on the following morning. The messengers are to bring back the money or the tickets O. K.-ed. By leaving it to the end of month and collecting by bills the telephone company lose at least 10 per cent. or more, but by collecting by tickets next morning and O. K.-ing them they can get every cent. For moving telephones a blank is used which the men get the subscribers to sign before the telephone is changed.

In the operating room Henry Ritterhoff is chief, and Miss Maggie Grossman, assistant chief, in place of Miss McDonald, resigned. Miss McDonald and Mr. David Livingston, foreman, were married on the 5th of May, and that takes one more good operator away from the central office. The chief operator has a monitor connected with all the head telephones, and also connected with the manager's instrument. When he thinks any girl is talking sweet to a subscriber he simply puts the phone to his ear, presses a button, and listens to all she says. He can also by the same simple process put the manager in listening connection, and there is very little unnecessary talk going on. The officers are apt to break in on the most sacred confidences with a practical "stop that, if you please." Mr. Ritterhoff makes an excellent chief, and the operating room works smoothly and with scarcely any noise. The cables which pass under the floor and come up behind the boards are all boxed in nicely. A water motor is used should the flour mill, where the power generators are located, stop from any cause.

A new 200-wire switch-board is on the way, but has not reached here yet. Meantime there are twenty-six new orders ahead, and but about eight drops empty. Had the exchange been given switch-board room in time the April showing would have been the best in the history of the company. All the inspectors, collectors, chief operator and foreman of construction wear uniforms: blue cloth and smooth brass buttons. They make a fine appearance.

Mr. Macquarrie, the manager, is going for the dead beats, and jerking their instruments out when they fail to pay.

Henry's electrical motor is decided to be a success. They have had several trial trips, and it works like a charm.

The cable road is not running yet. Mr. Gillam, the chief engineer, was seriously hurt recently. He went down in the tunnel to adjust the grip when it slid down and struck him behind the ear, exposing the brain. It was thought he was fatally hurt, but the doctors now say he will recover.

The Kansas City base ball nine have been covering themselves with glory and money also. Their new ground is connected by telephone with the city, and with all the world by the Western Union Telegraph.

The electric light company is doing a good business here; Mr. E. R. Weeks, superintendent. Electricity is well patronized out this way by everybody. MONITOR.

.... The receipts in England in the telegraph service from April 1st to April 18th, 1885, amounted to £65,000, an equal sum having been received up to the 19th April last year.

### Early Telegraphy.

A CONVERSATION WITH THE LATE GENERAL ANSON STAGER.

In a conversation a few years ago, General Anson Stager said: "I was one of the original Morse operators. Formerly, you may remember, we had registers, and narrow strips of paper like tapes wound around them. As the weights pulled the tape down past the instrument, the key-marks and the Morse alphabet would be indented, and from these indentations the operators read the messages on the tape.

"I was the first telegraph operator at Pittsburgh. It was early in 1847; the wires there first stretched across the Alleghanies. But we didn't do much business in those days. In fact, half the work of the office was showing strangers how the instruments worked. They would come in, gaze around, express their wonder, and ask the most singular questions. Many a time have I called on Philadelphia to tell how the weather was for the information of visitors. They would go into raptures at hearing that the thermometer stood so high or so low, or it was windy, rainy or clear.

"I remember that one day my little office was filled with a bevy of the women, led by Mrs. McKay, a beautiful woman, wife of the leading bookseller of Pittsburgh. For their gratification I asked Philadelphia the usual questions. The reply came ticking back, and I wrote on the margin of the tape beside each Morse character the common alphabetical equivalent. In that way, of course, they could spell out for themselves the message, and they were greatly delighted with the performance. Mrs. McKay took up the tape, weighed it in her hands, and said: "Now, you couldn't send any wider or heavier paper over the wires, could you?" Everybody laughed at this view of it. She had an idea the tape stretched over the mountains from Philadelphia.

"I think that I was about the first to read messages by sound. Certainly I had to read them before I knew of any one else doing it. Erastus Brooks, just about that time, came to Pittsburgh and bought out the *Gazette*. It was a responsible duty to collect the telegraphic dispatches, and the chief editor used to come himself to my office for that purpose. The markets were sent in cipher. One day my register broke down while Brooks was waiting for the report. A steamer had just landed in New York, and the news was important. But the register was in such a state that patching wouldn't do. Brooks was in despair. Now, the office call of a telegraph station is easily learned. You have 'De,' for instance, for Detroit, 'Bu' for Buffalo, and 'H' for Cleveland, the C's being taken up somewhere else on the line. The constant reiteration of De, or Bu, or whatever the office call is, makes it familiar and as easily recognized as the sound of a man's name. Of course, in those days, just as now, our office calls were recognizable to the ear. It was with this in mind that I said to Brooks, 'Wait a little and I will try another plan.' I explained matters to the operator at the other end, asked him to go slow, and, between my knowledge of the cipher and the good-natured repetition of each link of it by my down East friend, I managed to get the whole of the market report. It came slow, but came in time. Brooks left a delighted man. I make no claims, but I'll tell you my own experience. It was always a question among us whether Mr. Barnes or Governor Cornell was the first to read and send by sound. Some say it was Brown, some Cornell."

"The former Governor of New York?"

"The same. Governor Cornell was an old-time telegraph operator."

"Did the new improvement take?"

"On the contrary, the officers fought against it. Every commercial message, they said, must be read from the tapes. They insisted that they wanted something for a record. We used to bundle up the tapes and keep them for reference, to compare for errors, and find out whether the receiver or the sender was to blame. It was a long time before the officers discovered that such errors would be detected just as well from taking a letterpress copy of the message. But reading by sound is not the only thing. It has immensely increased the efficiency and capacity of the telegraph."

## TELEGRAPHIC

.... Numerous attachments are being put upon the Bankers and Merchants' Telegraph Company at various points.

.... The Baltimore & Ohio Telegraph Company is building a branch line from Stoughton to Brockton, Mass.

.... The American District Telegraph Company, of Baltimore, announces a general reduction of the salaries of all employes May 15, giving as a reason for such action "the ruinous competition between the Western Union and Baltimore & Ohio Telegraph Companies."

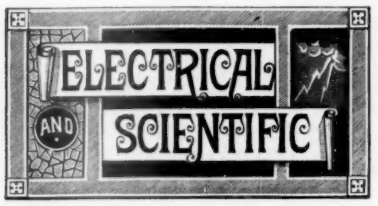
.... The introduction of cheap telegraphic rates in this country and Great Britain has brought forth the prophecy that messages will eventually be transmitted in the phonetic language. The great additional use of the telegraph resulting from the cheap rates compels consideration of a change of this kind. It is now found difficult to get all the business through.

... The City of Columbus, Ga., has contracted with the Gamewell Fire Alarm Telegraph Company, of New York, for a complete outfit for a telegraph fire alarm, with 16 signal boxes. It has also contracted with the Columbus Iron Works for the erection and satisfactory operation of the same, for the sum of $3,500, which will be done under the supervision of Mr. E. W. Jenkins, of Columbus, Ga.

.... The military telegraph poles erected in connection with the Suakim and Berber Railway, in Soudan, are being fixed with great rapidity. The foundation for the pole is a short cast-iron pile, which is driven into the ground without any digging; hence great stability is obtained. The labor of planting poles by this method is 80 per cent. less than under the old method of sinking a buckled plate in the earth, two men doing the work of ten. The rigidity of the foundation enables the straining of the wires to go on simultaneously with the erection of the posts.

.... There is much study devoted to the method of transmitting and receiving the Roman characters instead of the Morse alphabet. There is promised in this connection a new invention that will make the telegraph operator's work so easy that the years spent in learning the business will be time wasted, as any one who can skillfully manipulate the type-writer will be on the same footing as the expert worker with the key. This invention will not be hailed with delight by the operators, if it fulfills its promise, as the tendency would be to make their skill less valuable.

.... It is interesting to note the part the Atlantic cable and the telegraph bear to the present war movements. Two vessels carrying the trappings of war were anchored off the coast of the United States at Norfolk, Va., the English ship apparently there for the purpose of keeping vigilant watch over the moves made by the Russian corvette. Taking advantage of an evening when the English officers were enjoying a dance in the city—all ship officers are good dancers—the corvette quietly weighed anchor and departed, so secretly that two of her own crew were left behind The first information the English commander had of her departure and destination was that shown him the next day, in the telegraphic columns of a daily paper, the Associated Press telling the reading world that the Strelok was in the New York harbor. The same medium carried the news to England, and it is very probable the commander of the Garnet received prompt cable instruction to follow, the intelligence crossing the Atlantic twice before becoming known to the most interested party located a few miles from its source. The English commander lost no time in following the path of the swift-sailing Russian, and it would have been a graceful act had he provided passage for the sailors left behind by the corvette, whose ill luck the telegraphic columns of the daily press had made known to him.




* * Platinum has been discovered in New South Wales in the Ophir, Hunter and Macleay districts, and at Wiseman's Creek a nugget weighing more than half an ounce has been found in connection with alluvial gold.

* * Philadelphia now has a time ball on top of the Maritime Exchange. It is directly connected with the United States Naval Observatory at Washington, and drops precisely at twelve o'clock noon, mean time of the 75th meridian. If for any reason the ball fails to drop on time, it will not be lowered until after 12.30 P. M.

* * As a rule, longevity is less frequent than people think. The age of 80 is reached by only one person in 18, the age of 100 by one in 3,500, and the age of 110 by one in 1,000,000. Out of 1,000 individuals, 74 die between 60 and 70, about 55 between 70 and 80, 24 between 80 and 90, and not more than one between 90 and 100. The average of life seldom exceeds 30 years, even in the best regulated families and temperate communities.

* * To measure an electric current, the cathode is a platinum cup, and the anode a silver leaf enclosed in filtering paper. The anode is immersed in a solution of nitrate of silver contained in the cup, and an ampere deposits 4 grammes (62 Troy grains) of silver per hour. It therefore suffices to allow the current to pass through the voltameter for half an hour, or an hour, in order to obtain a deposit of silver, which may be weighed correctly on an analytical chemist's balance.

* * A correspondent opportunely asks: "In the interest of humanity, why cannot a law be passed compelling owners of tenement and apartment houses to have their buildings equipped with electrical apparatus with which the tenants can be promptly notified of the discovery of a fire." There are simple and inexpensive appliances which can be easily operated by any one, and which could be so used as to give the occupants of burning buildings such warning that they would have much better opportunities for escape than they now have.

* * It is satisfactory to note that Professor Ira Remsen, of the Johns Hopkins University, is now enabled to continue uninterruptedly his exceedingly interesting and suggestive researches on chemical action in a magnetic field, notwithstanding the pressure of other important original scientific work on his time and attention. He promises an account of his progress in the investigation of the influence of magnetism on chemical action as soon as he conveniently can present the details of the experiments and the conclusions to which they lead.

* * Practical work by students of electrical science is essential in mastering its intricacies. Satisfactory results will be shown when study and discussion are side by side with experiment and test. Should the many young men who are desirous of improving their knowledge in this field of wonders arrange to meet weekly in their respective cities, and with the assistance of one or more practical electrician spend an hour in exchanging views and illustrating by experiment, the advantage to each would be pronounced, and the work continually grow in interest.

* * At the International Inventor's Exhibit, London, the most extensive exhibits seen are the implements of war, of which there is a remarkable display. The show of appliances of electricity is excellent. The court assigned to America is not more than one-third applied for, and it was necessary to fill it with the goods of English exhibitors. Much disappointment on this account was expressed, but the cause of the apparent neglect is largely explained by the fact that American inventions are seen in all parts of the exhibition. The Russian court adjoining contains nothing as yet but a score of unpacked cases.

* * It is stated that a German engineer has made an important discovery in aeronautics, by which he is enabled to condense or expand the gas in a balloon. The agent he employs is compressed carbonic acid, with the help of which he says he is able to ascend or descend at pleasure. This vertical movement would put it in the power of the aeronaut to go up or down until he finds a current of air moving in the horizontal direction he wishes. Should all this prove true, the discovery would be an important one for military operations, because in time of war a balloon would be able to reach the enemy's territory and ascend or descend without requiring a fresh supply of gas.

* * Here is something new for the "bloated" gas monopolists to consider:—"Sir W. Gull lately testified to a surprising case before the committee of the House of Lords on intemperance. A large, bloated man who was suffering from difficulty of breathing and great distension of the venous system, died at Guy's Hospital. At the *post mortem* of the following day there was no sign of decomposition, and the body was believed to be distended with gas. "When punctures were made into the skin," said Sir William, "and a lighted match applied, the gas which escaped burned with the ordinary flame of carburetted hydrogen. As many as a dozen of these small flames were burning at the same time."

* * Martin Kiliani, of Munich, who has from time to time written several interesting articles on electrolysis, is the patentee of a method of zinc extraction. The material to be worked—precipitated zinc oxide, calamine, calcined blende, zinc ashes, etc.—is placed in lead-lined wooden vats, and digested with a liquor consisting of ammonia and ammonium-carbonate, till the liquor is saturated with zinc. After filtration the solution then passes to a reservoir, from which it is fed continuously to the precipitation tanks. The cathodes in these are of zinc or brass, the anodes of sheet iron. A portion of the zinc in solution is precipitated in a compact metallic form on the cathodes, with a corresponding liberation of oxygen at the anodes. The liquor passes through the precipitation tanks at a speed regulated according to the amount of zinc contained and the strength of the current at the electrodes, and then flows into a reservoir at a lower level, from which it is pumped up again into the first tanks to extract a fresh amount of zinc, and pass again to the precipitation tanks. All the vats and reservoirs are well covered over to prevent loss of ammonia.

* * The mines of Marles, near Bethune (Pas-de-Calais), offer an example of the numerous applications to which electricity readily lends itself. The mines are not only lighted by the fluid; they possess a telephone system, an electric signaling apparatus, and other equally useful installations. The lighting is effected by 60 Edison incandescent lamps in the buildings and offices, and four arc lamps, of 32 candle-power, placed at the shafts. The signaling apparatus is at the bottom of the mine, and replaces the ancient system of communication by cords or rods, which were uncertain and irregular in their action. The different telephone stations, numbering three to each shaft, are connected by a network of conductors, arranged in such a manner that the signal assures the sender of the faithful transmission of his call. This signal is given by a needle which indicates upon a graduated dial the nature of the signal given, while attention is called by a bell of the ordinary pattern. These arrangements are said to so economize time that ten tons of material can be raised in excess of that found to be possible with the old system. In order to insure the proper working of the ventilators in the subterranean passages, there is also an electric tell-tale, which shows the number of revolutions made by each fan in a given time. The whole of the installations have been put down by Breguet, under the direction of M. Thiry, the chief engineer of the company.

## The Edison Company's Suits.

The Edison Electric Light Company have commenced, in the United States Circuit Court for the Southern District of New York, suits against various alleged infringers upon the Edison patents for incandescent electric lighting, and against a representative number of users. Preparations for this have been going on for some time. The companies made defendants in these suits are the United States Electric Lighting Company, the United States Illuminating Company, the Consolidated Electric Light Company, the Swan Incandescent Electric Light Company, the Remington Electric Light Company, and the Schuyler Electric Light Company. Inasmuch as the suits in all these cases are for the determination of absolute ownership, by patent, of the right to control all the great essentials in incandescent electric lighting, their issue directly affects, in this way alone, not less than $15,000,000 of invested capital. They are based on infringements claimed in patents as follows: No. 223,898, T. A. Edison, Jan. 27, 1880, Electric Lamp; No. 227,229, T. A. Edison, May 4, 1880, Electric Lights; No. 230,255, T. A. Edison, July 20, 1880, Method of Manufacturing Electric Lamps; No. 239,149, T. A. Edison, March 22, 1881, Incandescent Electric Lamp; No. 239,153; T. A. Edison, March 22, 1881, Electric Lamp; No. 248,419, T. A. Edison, October 18, 1881, Electric Lamp; No. 248,424, T. A. Edison, October 18, 1881, Fitting and Fixture for Electric Lamps; No. 251,554, T. A. Edison, December 27, 1881, Electric Lamp and Socket or Holder; No. 263,140, T. A. Edison, Aug. 22,1882, Dynamo Electric Machine; No. 264,498, Wm. Holzer, September 19, 1882, Electric Lamp; No. 265,311, T. A. Edison, October 3, 1882, Electric Lamp and Holder for the same; No. 265,777, T. A. Edison, October 10, 1882 Method of Treating Carbons for Electric Lamps; No. 266,447, T. A. Edison, October 24, 1882, Electric Incandescent Lamp; No. 288,318, T. A. Edison, Nov. 13, 1883, Regulator for Dynamo or Magneto Electric Machines; No. 307,029, T. A. Edison, October 21, 1884, Filament for Incandescent Lamps.

The Edison Company have also instituted proceedings against prominent representative users of the alleged infringements, which are the Union Club, Fifth Avenue and Twenty-first Street; the Mortimer estate, owners of the Mortimer building; the directors of the Park Bank; the directors of the United Bank; Wm. H. Jackson & Co., 31 East Seventeenth Street; the Providence and Stonington Steamship Company, which use the light of some of the companies on the steamboats Rhode Island and Massachusetts; M. Costello, 929 Broadway; Van Derveer & Holmes, 54 Vesey Street; John A. Duff, Standard Theater.

Mr. John C. Tomlinson, solicitor of the Edison Electric Light Company, said, in an interview: "Mr. Edison's claims in his original patent are for 'an electric lamp for giving light by incandescence, consisting of a filament of carbon of high resistance,' and 'the combination of carbon filament with a receiver made entirely of glass and conductors passing through the glass, from which receiver the air is exhausted.' Grant him those—and both have been granted all over the world—and what is there left of the incandescent electric light, outside those essentials, for anybody else? We are perfectly satisfied that the suits must result in giving the Edison Company a monopoly of incandescent lighting."

Mr. Edward H. Johnson, President of the Edison Company for Isolated Lighting, when asked why suits against infringers had been so long delayed in this country, replied: "Because Mr. Edison would not give any time or attention to litigation while he was still engaged in perfecting the commercial application of his system for general incandescent electric lighting from central stations. He had demonstrated its feasibility scientifically, but had yet to prove it economically to put it into competition with gas. To that problem he has devoted himself with scarcely any intermission from October, 1878, until he deemed his system perfect in January last. In that time he has had granted to him about 300 patents on incandescent electric lighting, of which twenty are fundamental, and the maintenance of his right to which will effectually shut out all practical rivals all over the world. And it is time that his rights were asserted. When the object of his experiments was made known, the whole scientific world said he was pursuing an *ignus fatuus*, and derided him. When he attained his object, they said he could not do it economically enough to be commercially practical, and when he did that, one-half of the scientific world tried to steal the honor and profit of his discovery."

Mr. T. A. Edison, said: "I guess that Mr. Johnson and Mr. Tomlinson have said about all that there is to say on the subject at the present time. I do not claim to have been the discoverer of the possibility of a certain amount of illumination from an incandescent conductor of the electrical current, but I do claim—and can make good my claim—being the inventor of the only means for making the incandescent light practical. Before me, everybody who had experimented in that direction, endeavored to employ conductors of low resistance. I took exactly the opposite course, working with conductors of high resistance. When I had demonstrated that was the right way, they all suddenly discovered that that was just what they had been doing all along. At least they said so, which from their point of view was quite the same thing. Subdivision and high resistance are my discoveries, and the great principles upon which my patents are based. So original was all I did that I even had to coin words and applications of words—as, for instance, the specification, 'a filament of carbon'—since common in the literature of electricity, and used by my imitators in their applications for patents al the time, but unused before I employed them. Some of the patents upon which they base their claims are rather funny. The Swan patent is only upon the detail of making the carbon of parchment paper, which I tried, and which neither the Swan light people nor anybody else is using now. The Maxim patent, although the drawings make it look as if it was for a lamp, is only for a method of exhausting the air from the globe of the lamp and filling the space with inert gas. The only durable and perfect way is that of a high vacuum in the globe, the attainment and preservation of which I have covered completely by patent. There is no question in my mind about the courts sustaining the validity of my twenty fundamental patents, beyond which anybody is welcome to everything they can find in the way of details of application, that I have not already protected by the remaining 297 subsidiary patents. The infringers do not affect my station system, for it is too big a thing for them to handle, and is too well secured in very many ways, but they have thought that they could, with impunity, interfere with my control of the field of isolated electric light plants. They will find that they have been mistaken. There are now in use in this country over 600,000 of my lamps, all giving perfect satisfaction in every way, so that people can have no doubt about what my light will do."

## The United States Company's Suits.

The United States Electric Lighting Company have brought suits upon the following patents against the Edison companies:

No. 244,277, H. S. Maxim, July 12, 1881, incandescent electric lamp. No. 252,836, M. G. Farmer, January 24, 1882, electric lighting systems. No. 253,817, M. G. Farmer, February 14, 1882, electric lighting apparatus. No. 254.032, H. S. Maxim, February 21, 1882, incandescent electric lamp. No. 259,614, Edward Weston, June 13, 1882, safety device for electric circuits. No. 259,618, Edward Weston, June 13, 1882, dynamo electric machine. No. 277,644, Edward Weston, May 15, 1883, dynamo electric machine.

The officers of the United States Electric Light Co., in an interview, to-day, state the following:

"As the Edison Electric Light Company do not manufacture or sell any apparatus, these suits were brought against the Edison Ma-

chine Works and the Edison Company for Isolated Lighting, as manufacturers and sellers of the alleged infringing apparatus.

"The United States Company claim that the incandescent light *per se* is old, and that Farmer, some twenty-five years ago, so far as the system of distribution and regulation of the incandescent light is concerned, did what is done now in practice. He at that time lighted his house in Salem, Mass., with incandescent lamps, using substantially the same system of distribution and regulation as is used to-day. The United States Company own various patents of Farmer's controlling these systems of distribution and regulation, and claim that every plant that the Edison people erect is an infringement of these patents. Further, Edward Weston was one of the earliest workers on dynamo electric machines, and invented and procured patents for inventions, many of which were fundamental and of great importance, and which the United States Company claim the Edison machines infringe. A great deal of very important work was done by Weston long before Edison turned his attention to the subject of electric lighting or dynamo machines for any purpose. All of these patents belong to the United States Company. Maxim, also, did a great deal of work on incandescent lighting early in the history of the art. It is stated as a fact not generally known to the public that the first incandescent lamp which Edison claimed to have perfected, and which was heralded to the world as a solution of the problem of electric lighting, and for which he was granted a patent, was invented by Maxim; and, after a bitter fight in the Patent Office, in which Maxim was victorious, though the Edison Company appealed the case until it reached the highest tribunal, Maxim was declared the original inventor and the patent granted to him, thereby making Edison's patent void. This was the famous platinum lamp, the announcement of which caused such a heavy decline in gas stocks in England. It is claimed that the first commercial installation of an incandescent plant made in this country was by the United States Company in the Mercantile Safe Deposit Company's vaults, 120 Broadway.

"This was in 1880, and since then thousands of these lights have been installed, but not till now have the Edison Company brought any suits. Maxim obtained a great many patents covering essential features of incandescent lamps, and these patents are all owned by the United States Company, and infringers will be vigorously prosecuted. The existence of the patents, which the Edison Company claim control the incandescent lamp, has, of course, been known to the United States Company, but they have been advised by most competent experts and counsel that the claims cannot be sustained with any such construction as would cover the lamps they are using, and that the United States Company have good reason to know this is evidenced by the fact that they have invested large sums of money and carried on an extensive business. The United States Company present the claim that the incandescent lamp was old when Edison began experimenting, was known to every student of electricity, and that it should be remembered that the lamp itself is but a small part of an electric lighting system, and that any patent on any special form of lamp can control incandescent lighting is evidently an absurdity. It is also well known that Edison was not an early experimenter in the science of dynamo-electric machinery, and all recent inventions pertaining to dynamos cover merely specific devices. Farmer was one of the pioneers in this line, and Weston began his work as early as 1872.

"The United States Company now own some 350 patents, covering the apparatus which they manufacture. They have a large corps of the most experienced counsel and experts retained, many of whom have made this subject a special study for years. They number among their counsel Benjamin F. Thurston, of Providence; Chauncey Smith, of Boston; Edmund Wetmore, Samuel A. Duncan, Frederick H. Betts, of New York, Marcellus Bailey, of Washington; and as electrical experts, Professor Henry Morton, Frank L. Pope, Henry B. Renwick, Ed. S. Renwick, Edward E. Quimby and others."

—— The Schuyler Electric Light Company have completed arrangements for the Middletown plant purchased of them by a syndicate of Middletown capitalists. The organization of the local company and articles of incorporation will be completed this coming week. The engine and boilers chosen for both the Middletown and New Britain Schuyler plants, are those of the Fitchburg Company's make.

—— Danbury, Conn., expects to have her streets lighted throughout in about two weeks. This will be the first New England city lighted with the tower system. The Schuyler Company, who are putting in this plant use their own tower, the invention of their Superintendent of Construction, B. F. Orton. The fire towers having four lights each, will be supplemented by additional pole lights wherever the shrubbery or overhanging buildings render them necessary.

—— At a recent meeting of the City Council of Portland, Me., Alderman Noyes, as gas agent, read a proposition from the American Electric Light Company offering to maintain one hundred electric lights at a cost per night of 50 cents a light. The city is to pay the company $18,250 per year, and the company will extinguish all gas and naphtha lights. Alderman Noyes stated that as this would reduce the income of the gas company, in which the city is interested, and would also lessen the expense of lighting the streets, he should soon ask for instructions as to the course to be pursued by him.

—— A plant of the United States Electric Light Company in use by Fred. Oppermann's brewery, this city, is put to the use of lighting the interior of casks and vats, accomplished with the aid of a convenient incandescent lamp, attached to a flexible conductor, so arranged that it may be detached at will and removed to any part of the brewery. By its employment all danger and loss of life or property through fire or explosion is completely obviated, and at the same time the varnishing can be so completely and thoroughly accomplished that it is unnecessary to remove the casks, etc., from the cellars every season.

—— Articles of incorporation have been filed by the Jenney Electric Light Company, of Indianapolis, Indiana, with the Secretary of State. The incorporators are Addison H. Nordyke, Daniel W. Marmon, Amos K. Hollowell, Brainard Rorison and Charles D. Jenney. The Nordyke & Marmon Co., are widely known as milling engineers, and with the exception of Messrs. Rorison and Jenney the above named gentlemen compose that firm. For the present the necessary accommodations will be had at the Nordyke & Marmon works, but new buildings are shortly to be erected for the exclusive use of the electric company.

——The annual meeting of the Rhode Island Telephone and Electric Company was held last Wednesday. The report of the Secretary and Manager, John W. Duxbury, showed that sub-companies had been formed in Boston, New Bedford, Fall River, Taunton, Brockton, Worcester, Springfield, Pittsfield, Lowell, Lawrence, Lynn, Newburyport, Salem and Attleboro, in Massachusetts; and in Providence, Woonsocket, Pawtucket and Westerly, in Rhode Island; and that negotiations were pending in New Hampshire and Connecticut. The system, as now organized, is working with good results. The Treasurer's report showed that the financial condition of the company was good, the balance in excess of capital and liabilities being $35,000. The company has paid during the year two dividends of four per cent. each, amounting to $8,000. The following Board of Directors was re-elected: The Hon. Jonathan Chace, Henry G. Russell, ex-Governor Henry Howard, Henry C. Cranston, J. U. Starkweather, Dr. F. H. Peckham, Jr., R. G. Hazard, 2d, H. F. Barrows, J. Lewis Pierce, and J. W. Duxbury. The following officers were re-elected: President, Henry Howard; Treasurer, Chas. T. Howard; Assistant Treasurer, R. H. Whittier; Secretary and General Manager, J. W. Duxbury; Assistant Manager, F. H. Gardiner.

—— "Lose money! Why, I have lost more money than you ever saw. Five years ago I lost $1,000,000 in Paris." "How was that?" "There wasn't a single electric light in that city; not one." "How did that lose your money?" "How? By not supplying the city with electric lamps." "Yes, but they wern't invented at that time." "I know it. That's how I lost money—by not inventing them."—*New York Graphic.*

——Ocean cables connecting England with China, India and Australia are said to be in danger from Russian cruisers. The general question of keeping open cable communication in the event of war is an absorbing topic in telegraphic circles in London. It is believed that the Western Union and Mackay-Bennett cables will not be molested on account of their purely American ownership, and, to prevent damage to the cables, the Government will have to station a line of ships in such numbers as could with difficulty be spared in war times. It is more than likely, in case of war, that the owners of the cables will have to protect them at their own expense, without the aid of the Government.

—— Articles of incorporation of the Brush-Swan Electric Light Company, of Central New York, capital $150,000, were filed at Utica yesterday. The trustees are William S. Bartlett, cotton manufacturer, A. M. Mills, lawyer, Charles S. Symonds, president of the City National Bank of Utica, G. M. Lowery, manufacturer of woolen goods, and Wm. R. Hoath, clothier. The new company is composed of some of the strongest business men of Oneida county. They will enter upon the business of both arc and incandescent lighting at once and have already bid for all of the city lighting of Utica outside of "Naphtha district" for $19,500 a year.

—— The following contracts for lighting the city of New York during the coming year have been awarded: The United States Illuminating Company; all the streets and parks now lighted by it, together with Catharine street from Chatham street to the East River, Chambers street from Broadway to the North River, Fulton street from river to river, and Canal street from the Bowery to the North River, at 70 cents a night for each lamp. The Brush Electric Illuminating Company; all the street and parks now lighted by it at 70 cents a night for each lamp. A petition, signed by leading downtown business men, was presented the city council at the same time, asking that the streets leading to the ferries at the lower end of the island be illuminated with the electric light. It was stated that there was only $12,000 available for the extension of the electric light. Commissioner Squire said he was in favor of extending the electric light system, and it was finally decided to use the $12,000 in lighting the additional streets included in the contract awarded to the United States Illuminating Company.

—— Bangor, Maine, was lighted by electricity last week, for the first time. The wires run through all the principal streets, and some of the prominent business houses supplied with from one to four lights. The present dynamo capacity of the plant is to supply 114 arc lights, and it is the intention of the company to considerably enlarge this capacity, as will be necessary from the amount of additional lighting which the station will be required to furnish. Another scheme under consideration is to introduce the incandescent light of the Edison system. The company already owns the large three-story brick building in which the station is located, and it has ample room for boiler and engine power to light the entire city. The two engines are models of perfection, and were made by the Armington & Sims Engine Company, of Providence, R. I. Among those present at the opening was Mr. Edward H. Goff, of Boston, President of the American Electric Company; Major L. B. Wright, of Boston, the engineer who planned the station; Frank H. Williams, of Boston; Mr. Frank A. Sawyer, General Manager of the American Company's large electric lighting station in Portland, Me., and many other gentlemen prominent in electrical work.

## ELECTRIC LIGHT NEWS

—— Americus, Ga., wants electric light, telephone exchange and water works. They should have them.

—— The Hyde Park Electric Light and Power Company has been organized to provide electric lights for the streets. The capital is $25,000.

—— In Paris it has been carefully determined that the cost of gas lighting as compared with that of lighting by means of electricity is as 431 to 344.

—— Mr. Henry Hines, of the United States Electric Light Company, has transferred his field of operations from Chicago, where he has been for nearly a year past, and will in future be found at the general office of the company in this city.

—— Two German inventors were arrested on suspicion in England. They were accused of having in their possession an infernal machine. The excuse of the mistaken policemen is said to have been that they got the words dynamo and dynamite mixed.

—— The New Britain (Conn.) Schuyler Electric Light Company has been organized. Capital stock, $25,000. Incorporators—Andrew Corbin, John M. Spring, John Hanna, R. J. Vance, C. O. Case, Thomas McCabe, of New Britain, Chas. E. Dustin, E. Henry Hyde and H. M. Linnell, of Hartford.

—— The Brush Electric Light and Power Company, of Savannah, Ga., have been granted a new contract for lighting the city, at an increase of the number of lamps to ninety, and to run five years. The City Council is composed of leading business men, and favor the electric light as the city illuminant.

—— The Royal Electric Light Company, of Montreal, have completed its contract for lighting the City of Ottawa, Canada, with the Thomson-Houston system. The lighting of the city by this method has delighted the inhabitants, and the favorable comment on the excellence of the light is universal. The contract runs for three years.

—— An attachment was placed last Friday upon the property of the Bankers and Merchants' Telegraph Company by the Third National Bank of New York for $50,000. This is the bank in which the receivers of the Bankers and Merchants' kept their accounts, and they made the levy upon all the property, lines, poles, etc., in Rhode Island.

—— The electric light company, of Worcester, Mass., intends to take advantage of a sub-division of the business which has recently been developed—the leaving of the wiring of buildings, stores, dwellings, etc., to a company which makes that work a specialty—and will confine itself to the location and maintenance of the plant—the power, generators and street wires.

—— The New Britain Schuyler Electric Light Company filed its articles of incorporation with the Clerk of the county this last week. The plant has a capacity of 100 full arc lights of 2,000 candle-power, and will start with 75 lights. The capital stock of $25,000 has been fully subscribed, and among the stockholders appear the names of many of the most prominent citizens of New Britain.

—— In Waterbury, Conn., electric lights have been ordered by the City Council as follows: Four each on East, West, North and South Main streets and seven on Bank street. Of these last, three are recommended placed in the Brooklyn district. There are to be two on Grand street, one on Cooke, one on Union, one on Cole, one on Union Square, and one on Scovill bridge. The Committee asked for a grant of five more to be located at discretion, which was agreed to.

# ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING MAY 5, 1885.

316,956 Telegraphic relay; George W. Gardanier, New York, N. Y.

317,171 Incandescent electric lamp; Carl H. F. Muller, Hamburg, Germany.

317,213 Portable telephone; Oliver H. Saxton, Washington, Ohio.

317,235 Electric railway; Frank J. Sprague, North Adams, Mass., assignor to the Sprague Electric Railway and Motor Company.

317,245 Apparatus for the separation of gold from its ores by electro-chlorination and deposition; Edward P. Thomson, Elizabeth, N. J., assignor of three-fourths to Edward P. Roberts and G. H. Pierce, both of Cheyenne, Wyoming.

317,246 Apparatus for the electro-deposition of gold from its chlorides; Edward P. Thompson, Elizabeth, N. J., assignor of three-fourths to Edward P. Roberts and G. H. Pierce, both of Cheyenne, Wyoming.

317,249 Electro-magnetic reciprocating engine; Charles J. Van Depoele, Chicago, Ill.

317,252 Revolving telephone stand: E. Forest Weaver, Philadelphia, P., assignor of one-half to George H. Perkins, same place.

317,289 Electric liquid gauge and alarm; Jeffrey C. Boyle, Brooklyn, N. Y.

317,302 Subway or conduit for cable or electric railways; Thomas C. Clarke, Sea Bright, N. J.

317,409 Cartridge for electric firearms; Edgar A. Montfort, New York, N. Y., assignor by mesne assignments to the Universal Electric Arms and Ammunition Company, same place.

317,432 Electric weighing and recording device; Edward H. Amet, Chicago, Ill., assignor to Herbert A. Streeter, same place.

317,445 Telephone transmitter; George W. Drawbaugh, Eberly's Mills, Pa., assignor to the People's Telephone Co., of New York.

**A printed copy of the specification and drawing of any patent to the annexed list, also of any patent issued since 1865, will be furnished by any of the patent solicitors whose advertisements appear in this journal. In ordering please state the number and date of the patent desired.**

**If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40.00. Various other Foreign patents may also be obtained.**

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